

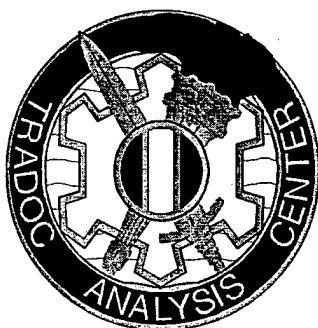
# REPORT DOCUMENTATION PAGE

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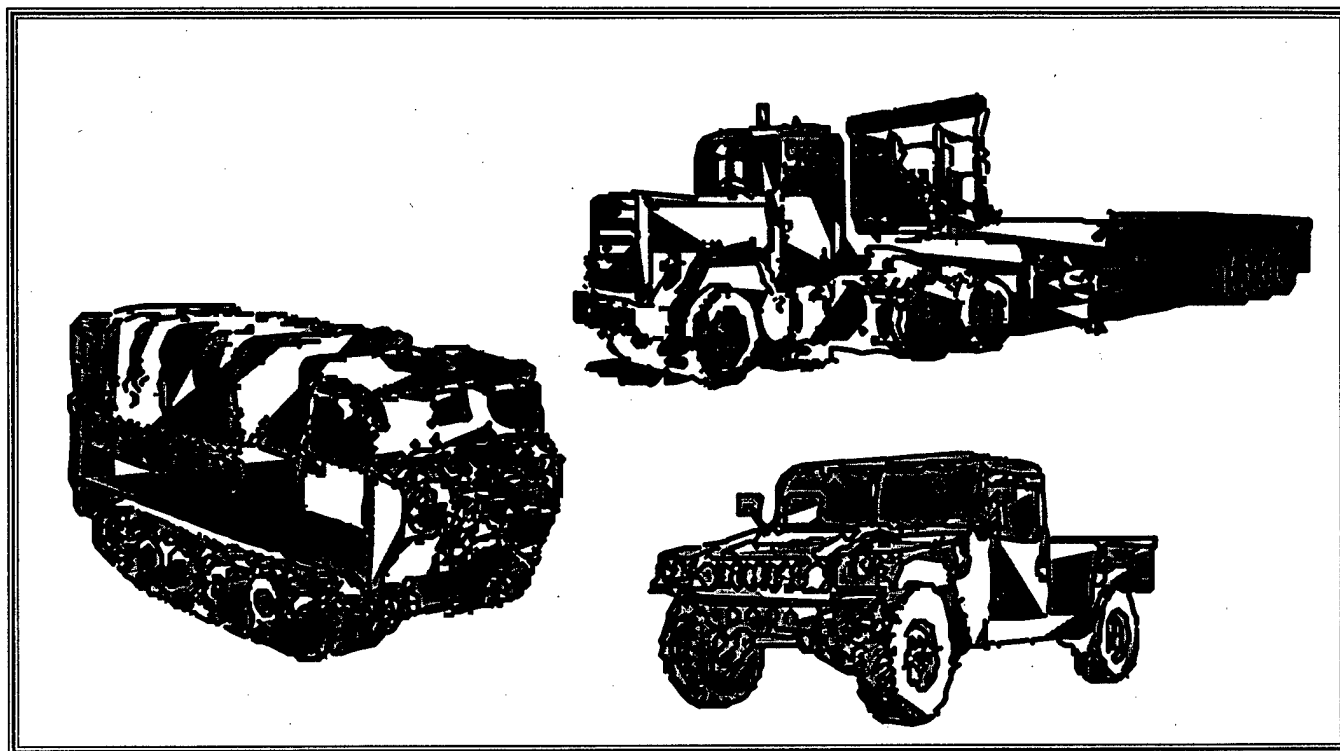
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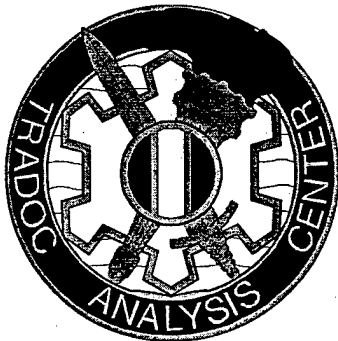
Study Report  
**Transportability on the Battlefield**  
prepared by

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**TRAC-TR-0697**

**May 1998**

**Study Report**

**Transportability on the Battlefield**

**prepared for the Chief of Transportation  
U.S. Army Transportation Center**

**Certified by**

**Coordination**

With comments on page iia

**Approved for Release by**

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## Transportability on the Battlefield, TRAC-TR-0677

This report covers the mobility requirements for the AOE Heavy Division and Force XXI Brigades that were "as existed in RDS on 26 September 1997".

The report does not include Force XXI Enablers or emerging Doctrine. Mobility, as defined in this study, is the organization's standard one-time-lift requirement.

# Transportability on the Battlefield

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## Study Gist

**AR 5-5 Study Title.** Battlefield Transportability Study (Transportability on the Battlefield).

**Purpose.** The purpose of this analysis was to determine movement capability of units on the battlefield and, identify shortfalls in terms of a workload that would require additional support from the transportation system.

**Main Assumptions.** In maneuver units, dedicated ammunition carriers, together with the associated weapon systems, are sufficient to carry the units' basic/combat load ammunition. Army Force Planning Data and Assumptions for per soldier planning factors are reasonable estimates of what will be on hand.

**Scope of Study and Limitations.** The analysis focused on the mobility of brigade size units. It evaluated Army of Excellence fully modernized objective Tables of Organization and Equipment as documented in the Requirements Documentation System. It included an AOE heavy brigade with associated units and an aviation brigade as developed under the Aviation Restructure Initiative. Emerging data from the Tactical Wheeled Vehicles (TWV) Study provided information to round out the heavy division. It also evaluated Force XXI mechanized heavy and armor heavy brigades as documented in the RDS as of 26 September 1997. Due to the ongoing nature of force structure development for Force XXI, these represent only a snapshot in time. Detailed Combat Service Support structure in support of the Force XXI brigades and details on cross-tasked division units were unavailable for this analysis.

Transportability data for the analysis were developed using actual equipment lists and may not reflect the status of unit mobility as described in section one of the TOE. Variations in actual TOE were not addressed. The analysis captured miscellaneous equipment and paraphernalia, such as Common Tables of Allowances items, by analyzing actual brigade data from a Sea-lift Emergency Deployment Readiness Exercise. Vehicles and trailers dedicated to ammunition were not included in the analysis, nor did the analysis reconcile basic or combat loads with the vehicles. The analysis did consider small arms ammunition based upon AFPDA planning factors. Tankers and fuelers, including trailers, were not included in the analysis.

**Findings.** None of the force structures analyzed is 100 percent mobile. Non-TOE equipment, small arms ammunition, and accompanying supplies represent a significant portion of the excess workload for all units. The expected workload from an AOE heavy division with one heavy brigade, two mech brigades, and an aviation brigade is over 2540 short tons, where 645 STON are TOE items and the remaining 1895 STON include accompanying supplies, small arms ammunition, and some CTA for the heavy brigade. This takes into account division units, and thus can be considered as a rough estimate for the division. The TOE workload identified for Force XXI brigades is small; however, there are not adequate assets in the maneuver units to accommodate accompanying supplies and small arms ammunition—149 STON for an armor heavy brigade and 154 STON for a mechanized heavy brigade.

**Impact of this Effort.** Excess workload data generated by AOE units was used to identify the workload for transportation units in the Total Army Analysis 05 laydown in September 1997. Force XXI information was used to identify the transportation system workload generated by the maneuver units at Brigade level and thus, also, to identify the support structure needed in the Force XXI divisions and at echelons above division to cover the workload. These findings will support the Headquarters Department of the Army directed TWV Study ongoing at TRAC-LEE.

**Study Director and Study Agency.** Training and Doctrine Command Analysis Center-Fort Lee (TRAC-LEE), ATRC-LP, 401 First Street, Fort Lee, VA 23801-1511; Jeannette Blumenthal, DSN 539-1818.

**Study Sponsor and Sponsor POC.** U.S. Army Combined Arms Support Command (CASCOM), Ms. Kathleen O'Neill, Combat Developments Directorate for Transportation, DSN 687-0356.

**DTIC.** Accession number to be assigned.

## **Transportability on the Battlefield**

**Purpose.** The purpose of this analysis was to determine movement capability of units on the battlefield and, identify shortfalls in terms of a workload that would require additional support from the transportation system.

**Background.** Based upon questions which arose during the Combat Service Support (CSS) Computer Assisted Map Exercise (CAMEX) after action reviews (AAR) about the mobility of units on the battlefield, MG Brown, then Chief of Transportation, requested that Training and Doctrine Command (TRADOC) Analysis Center - Fort Lee (TRAC-LEE) undertake an analysis of battlefield mobility/transportability. The memorandum is included in Appendix B, References.

### **Scope.**

A units' mobility is defined, in the context of this study, as the capability to move all of its equipment and supplies on vehicles and trailers organic to the unit. After discussions with Combined Arms Support Command (CASCOM) points of contact (POC), the analysis began by focusing on the mobility of a heavy brigade. This analysis was evolutionary. Initially, we relied upon the basic, straightforward weight and volume data available for equipment and vehicles, and made use of existing deployment models to estimate the capability of the heavy brigade. The methodology and preliminary findings are detailed in Appendix C. After extensive review and guidance from COL McGrady, Director of Combat Developments (DCD) for Transportation at CASCOM, TRAC-LEE revised the methodology to incorporate more realistic use of vehicles and equipment. This report documents that approach. Using a brigade as the basic building block, equipment lists from four types of brigades were analyzed: an AOE heavy brigade with cross-tasked units, an AOE heavy division aviation brigade, a Force XXI Mechanized heavy brigade, and a Force XXI Armor heavy brigade. The analysis of the Force XXI Brigades does not include any support units, since complete equipment listings for those supporting units were under development and not available for this study. Follow-on analysis, done to support the Tactical Wheeled Vehicles (TWV) Study, provided data on the AOE mechanized brigade and heavy division units not associated with the brigades.

Part I focuses on the Army of Excellence (AOE) fully modernized objective Tables of Organization and Equipment (TOE) as documented in the Requirements Documentation System (RDS) maintained at Fort Leavenworth. Part II focuses on Force XXI. Transportability data for the analysis were developed using actual equipment lists and may not reflect the status of unit mobility as described in section one of the TOE extracted from the RDS. Variations in actual TOE (modified TOE (MTOE)) were not addressed.

The AOE heavy brigade and associated units identified by Standard Requirement Codes (SRC) are listed in Table 1. Table 2 lists units of an AOE Infantry Mechanized (Inf (M)) brigade, not including any cross-tasked units. An AOE heavy division's aviation brigade units, as developed under the Aviation Restructure Initiative (ARI), are listed in Table 3. Table 4 lists the division units from the TWV Study. The units listed in Table 4 incorporate several of the smaller units included in the analysis of the brigades. The duplication has been shown here for completeness; however, numbers in the summary have been adjusted to avoid double counting.

The Force XXI mechanized (mech) heavy brigade and armor heavy brigade units are listed in Table 5. The Force XXI TOE used were as documented in the RDS as of 26 September 1997. Due to the ongoing



nature of force structure development for Force XXI, these represent only a snapshot in time. Since the major difference between a mechanized heavy brigade and an armor heavy brigade is the mix of units, we looked at both. Due to the level of detail needed—complete equipment and vehicle lists by line item number (LIN)—we were not able to include the CSS structure supporting the brigades, nor did we include any cross-tasking of division units.

Table 1. AOE Heavy Brigade

SRC	DESCRIPTION	PERSONNEL (3711)
87042L100	Headquarters, Headquarters Company, Armor Brigade	81
17375L000	Armor Battalions (2)	604 x 2
07245L200	Infantry Battalion (Mechanized)	825
05335L000	Engineer Battalion	444
06365L100	Field Artillery Battalion 155mm Self-Propelled	564
34397A000	Military Intelligence Company (Direct Support)	40
44177L100	Air Defense Artillery Battery	113
63005L100	Forward Support Battalion (2 X 1)	436

Table 2. AOE Mechanized Infantry Brigade

SRC	DESCRIPTION	PERSONNEL
87042L000	Headquarters, Headquarters Company, Mech Brigade	81
07245L200	Infantry Battalion (Mechanized) (2)	825 x 2
17375L000	Armor Battalions	604
63005L300	Forward Support Battalion (1 X 2)	434

Table 3. AOE Heavy Division Aviation Brigade (ARI)

SRC	DESCRIPTION	PERSONNEL (2314)
01302A000	HHC, Aviation Brigade	91
01385A200	Attack Helicopter Battalions, AH-64 (2)	326 x 2
17285L200	Cavalry Squadron	825
01305A000	General Support Aviation Battalion	746

The analysis used actual brigade data from a Sea-lift Emergency Deployment Readiness Exercise (SEDRE) to capture the miscellaneous equipment and paraphernalia, such as Common Tables of Allowances (CTA) items, which all units have and which are not listed on the TOE (or MTOE).

Table 4. AOE Heavy Division Units (TWV Study)

SRC	DESCRIPTION	PERSONNEL (11,270)
87004A200	HHC Division Headquarters	288
12113L000	Band	41
03157L200	Chemical Company	176
19333L000	MP Company	153
34394A000	MI Battalion	389
44175L300	ADA Battalion	638
11065L400	Signal Battalion	687
06302L000; 06395A000 06365A400; 06365A500	DIVARTY: HHB, 155 SP Bn; 155 SP Bn, MLRS Bn	2502
05332L000; 05335L000	Engineer Brigade: HHD, Battalions	1389
DISCOM (less FSBs)		3219
63002L000	HHC	214
63135A000	MSB	1117
63885A200	DASB	575

Table 5. Force XXI Conservative Heavy Division Brigades

SRC	DESCRIPTION	PERSONNEL
87040F200	Mech Heavy Brigade	(1460)
87042F200	HHC, Mech Heavy Brigade	98
07245F000	Mechanized Battalions (2)	451 x 2
17375F000	Armor Battalion	386
17087F000	Recon Troop	74
87040F100	Armor Heavy Brigade	(1395)
87042F100	HHC, Armor Heavy Brigade	98
17375F000	Armor Battalions (2)	386 x 2
07245F000	Mechanized Battalion	451
17087F000	Recon Troop	74

**Assumptions.**

The Army Force Planning Data and Assumptions (AFPDA) per soldier planning factors for accompanying small arms ammunition and accompanying supplies and equipment from the Military Traffic Management Command Transportation Engineering Agency (MTMCTEA) Deployment Planning

Guide (MTMCTEA Reference 94-700-5) are reasonable estimates of what the unit will have on hand. (See Table 6.) The planning factors are based upon theater-wide averages and may be somewhat overstated at the maneuver battalion level since they include a factor for Class VII; however, the overall impact on the division should be realistic. These planning factors do not include the individual soldier's gear which, at two duffle bags (or a duffle and a foot locker) per soldier, can require a significant amount of space—over ten cubic feet per soldier.

Table 6. Planning Factors

PLANNING FACTOR	POUNDS PER PERSON
Accompanying Ammunition	12.7
Accompanying Supplies & Equipment	219.35

Cargo Vehicle Load Limits—weight, height, and cube—from Technical Bulletin (TB) 55-46-1, Standard Characteristics (Dimensions, Weight, and Cube) For Transportability of Military Vehicles and Other Outsize/Overweight Equipment (In TOE LIN Sequence) are accurate and represent optimal capacity. According to the TB, the weight is the manufacturer's off-road rated load capacity in pounds. Height—not used in this analysis—and cube are the maximum loading height, in inches, and the related cargo compartment cubic capacity, in cubic feet.

The AOE Forward Support Battalion (FSB) has several vehicles listed in TB 55-46-1 as having no cargo capacity. We assumed that they account for the Authorized Stockage List (ASL), so these vehicles are not included as cargo carriers, and the ASL is not included in the cargo requirements. We identified dedicated ammunition carriers and assumed that they, together with the associated weapon systems, were sufficient to carry the units' basic/combat load ammunition. Note that for Force XXI, most, if not all, of the dedicated ammunition carriers have been shifted from the maneuver battalions to the supporting Forward Support Companies (FSCs) under Division Support Command (DISCOM) control.

The AOE Mechanized Infantry Brigade parallels the heavy brigade structure, i.e., the HHC and the maneuver battalions are the same.

### Limitations.

Force XXI. The Force XXI unit structure used is what was documented in the RDS as of 26 September 1997. Due to the ongoing nature of force structure development for Force XXI, this represents only a snapshot in time and is not precisely the same structure as shown on the organizational chart for the Conservative Heavy Division Design included for reference as Appendix D. The number of personnel for the units in this analysis is annotated on the chart for easier comparison and identification of differences. We did not attempt to identify any differences in quantity or type of equipment.

Ammunition. We identified vehicles and trailers dedicated to ammunition and excluded them from the rest of the analysis. We did not attempt to reconcile basic or combat loads with the vehicles. The only Class V we considered was small arms ammunition based upon AFPDA planning factors.

Water and Bulk Fuels. We identified all tankers and fuelers, including trailers, and excluded them from the rest of the analysis. In all units, fabric fuel drums (LIN G68966) and liquid dispensing tank units (LIN V19950) were included as cargo.

Countermine Team. We reviewed the Augmentation TOE for the Countermine Team (SRC 17576LB00), which includes mine clearing blades and rollers for Abrams tanks and the tractor/semi-trailer rigs to transport them; however, this TOE was not included in the analysis since complete information was unavailable to the study team during the time the analysis was conducted.

Modeling. The Vehicular Cargo (VEHCAR) model, a subsystem of the Transportability Analysis Reports Generator System (TARGET) used by MTMC/TEA to determine and analyze deployment requirements, loads alphabetically, by LIN, consequently packing is not optimized

**Methodology.** This section outlines the study methodology which is graphically depicted in Figure 1.

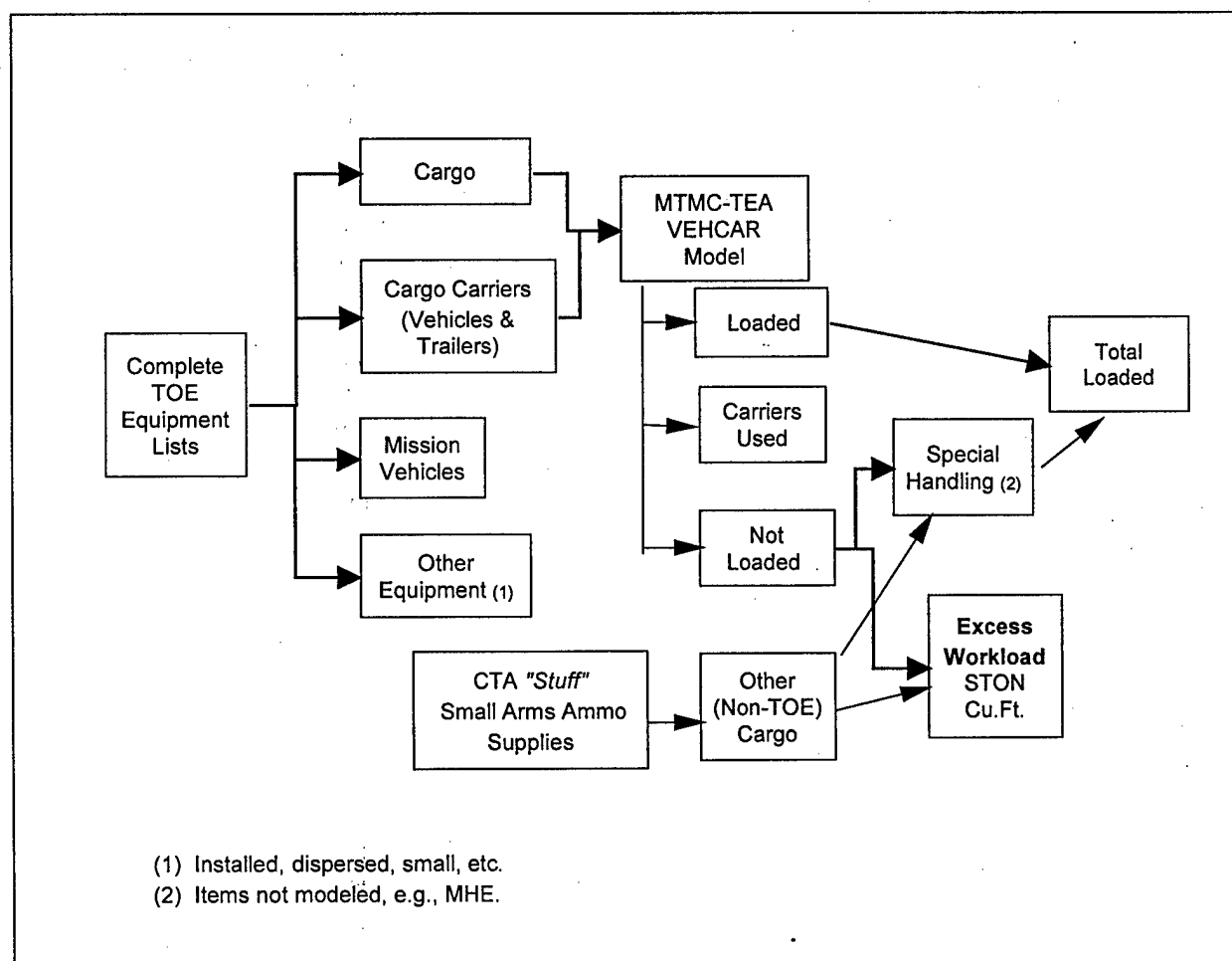


Figure 1. Methodology

Units and Equipment. After identifying the force structure and SRC for the units of interest, we requested detailed TOE equipment and personnel listings for those SRC from the US Army Force

Management Support Agency (USAFMSA). We divided the detailed equipment lists into four categories for each unit: cargo, cargo carriers (vehicles and trailers), mission vehicles, and other equipment. Mission vehicles included all weapon systems, tracked vehicles except those specifically designated as cargo carriers, recovery vehicles, semi-tractors (the trailer would be a cargo carrier), command and control vehicles, ambulances, etc. The other category included items which were installed on another piece of equipment, widely dispersed, or small, such as individual weapons. Items which would normally be found in the cab of a cargo vehicle were also placed in the other category. For each unit, the cargo carrier list of vehicles and trailers was provided to MTMCTEA, along with the cargo list by LIN.

Modeling. MTMCTEA extracts data from the Department of the Army Standard Equipment Characteristics File (ECF) from which TB 55-46-1 is compiled and which includes maximum cargo capacity in terms of weight and dimensions, as well as the exterior dimensions and overall weight, by LIN for vehicles and trailers; it also includes the dimensions and weight by LIN for other equipment. This information is input to VEH CAR model which uses a geometric loading algorithm to place cargo, an item at a time, into the identified cargo space, checking both dimensions and weight to ensure that the space is available. VEH CAR is a subsystem of TARGET which is used to determine and analyze deployment requirements. The model does loading alphabetically, by LIN, consequently packing is not optimized (which means that it may reflect more closely what actually occurs when a unit is preparing to relocate on the battlefield), and it represents only one possible loading scheme. The model input is normally the MTOE as it exists in the database (source: Forces Command (FORSCOM)), while the output is in terms of total tonnage, including vehicle weight and containerized cargo. After some minor reconfiguration, MTMCTEA used our tailored cargo and carrier lists as input and captured the detailed output before the model consolidated it into the reports. The reconfigured output consisted of two lists for each unit: (1) what was loaded and what it was loaded on, and (2) what was not loaded, including the total weight and the dimensions for large items.

By comparing the output to our original cargo carrier list we identified any remaining available cargo vehicles. We captured those items which the model does not process, such as material handling equipment (MHE), and loaded them onto the appropriate carriers off-line. The model does not load MHE since it considers that equipment to be self-deployable—at least for short distances, such as up the loading ramp onto a ship or aircraft—and thus not requiring a secondary carrier. The model also does not load certain semi-trailers since they may be stacked for certain types of transport.

Other Requirements. Weight and volume figures for supplies and equipment and for small arms ammunition were added to each unit's requirements and assigned to any remaining cargo space. In addition, a weight and volume estimate for construction and barrier materials (Class IV) was added to the Engineer Battalion requirements. At the brigade level, we developed a weight estimate for CTA items ("Stuff") based upon exercise data.

Supplies and Small Arms Ammunition. Based upon the planning factors listed in Table 6 and the number of personnel, we computed two additional weight estimates for each unit. The weight estimates were converted into volume based upon the mean cargo density by class of supply (Table 7). We assumed that the supplies and equipment were Class II. The small arms ammunition was, of course, Class V.

Construction and Barrier Materials (Class IV). We used the 1997 release of the Operations Logistics Planner (OPLOGPLN '97) (version 1.40) to develop an estimate for two days of Class IV consumption by the AOE heavy brigade to use as part of the requirement for the Engineer Battalion. OPLOGPLN '97 is a computer-based program designed to assist logistics planners in calculating supply usage estimates in support of operations. It allows the logistician to calculate supply estimates by class of

supply for selected units. OPLOGPLN '97 is designed specifically to support operations typically associated with multi-phase operation plans and operation orders and uses planning factors in terms of pounds per man per day. The user creates units based upon standard TOE, and maps these units into task organizations. The task organizations can then be assigned to a multi-phase order and assigned user-developed mission parameter sets. The model then generates supply consumption by unit, task organization, phase, and order. The weight estimate for Class IV was based upon the brigade consumption for two days in a hasty defense posture. This weight estimate was converted into volume based upon the mean cargo density for Class IV (Table 7).

Table 7. Cargo Density\*

CLASS OF SUPPLY	POUNDS PER CUBIC FOOT
I	11.29
II	10.28
III	18.45
IV	13.11
V	19.72
VI	12.19
VII	10.21
VIII	6.15
IX	12.91

\*In terms of common shipment, unit configuration, break bulk, mean density.

**Other Non-TOE Cargo.** We analyzed deployment planning lists from an actual SEDRE and, from the cargo listings, identified non-MTOE—and thus non-TOE—equipment. To avoid possible double counting, we eliminated those entries which could be classified as supplies or ammunition. The total weight of these items was added to the brigade's remaining unpacked cargo list.

**Data.** Appendix E contains spreadsheets itemizing the total equipment and vehicles for an AOE Armor Battalion. Sections detail our determination of the cargo and cargo vehicles, and MTMCTEA's modeling results—what was loaded and not loaded in terms of the cargo. Similarly detailed data is on file for the remainder of the units and may be obtained from TRAC-LEE.

## Findings.

### Part I: Army of Excellence Evaluation.

In the heavy brigade each Armor Battalion has all (15) of its Heavy Expanded Mobility Tactical Trucks (HEMTTs) identified as dedicated to ammunition. The Field Artillery (FA) Battalion has 15 Palletized Load System (PLS) trucks and 18 Tracked Ammunition Carriers dedicated to ammunition. All of the HEMTTs (17) in the Infantry (Mech) Battalion are designated for ammunition. Similarly, in the Aviation

brigade each Attack Helicopter battalion has all eight HEMTTs, along with the eight Heavy Expanded Mobility Ammunition Trailers (HEMATs), dedicated to ammunition. The Cavalry Squadron has 14 HEMTTs and two HEMATs dedicated to ammunition. These vehicles and trailers are not included in the cargo capabilities, nor is the ammunition for major weapon systems figured into the requirements for these units.

The FSB has 18 PLS flatracks and only three PLS trucks and three trailers. To move 18 loaded flatracks would require the six platforms to make three trips each or to be augmented from another organization. If they are not loaded, they can be stacked, but that would still tie-up the platforms for a trip. Either way they have an impact upon the FSB's mobility. These flatracks were not included in the requirement nor in the capability figures.

Based upon guidance from the CASCOM DCD for Transportation, High Mobility Multipurpose Wheeled Vehicles (HMMWVs) were not included as cargo carriers for this analysis; however, the trailers associated with them (3/4 and 1-1/2 Ton) were included.

Tables 8, 9, and 10 show the requirements and excess workload in short tons (STON) for units in the AOE heavy brigade, mechanized brigade, and aviation brigade, respectively. The requirement and excess workload are broken out by TOE items and the accompanying small arms ammunition and supplies (SAAS). The percentage of the total requirement which requires additional transportation assets is displayed in the last column. Totals may not be exact due to rounding.

Table 8. AOE Heavy Brigade.

AOE HEAVY BRIGADE UNITS	REQUIREMENT (STON)			EXCESS WORKLOAD (STON)			%
	TOE	SAAS	Total	TOE	SAAS	Total	
HHC	15.9	9.4	25.3	8.0	9.4	17.4	69%
Armor Battalions (2)	71.4	70.1	141.4	3.5	58.0	61.5	44%
	71.4	70.1	141.4	3.5	58.0	61.5	44%
Infantry (Mech) Battalion	71.4	95.7	167.2	2.5	70.7	73.3	44%
FA Battalion	45.6	65.4	111.1	15.0	65.4	80.5	72%
Engineer Battalion	61.4	83.4*	144.9	0	59.5	59.5	41%
ADA Battery	14.0	13.1	27.1	1.3	13.1	14.5	53%
MI Company (DS)	6.1	4.6	10.7	2.5	4.6	7.1	66%
Forward Support Battalion	240.7	49.8	290.5	68.8	44.8	113.6	39%
"Stuff"	---	---	150.6	---	---	150.6	100 %
Brigade Total	598	462	1,210	105	383	639	53%

\*Includes an estimate of 31.9 STON for Class IV, Barrier and Construction Materials.

Of the 639 STON requiring additional transportation assets, 105 STON are TOE items. The remaining 534 STON include 383 STON of accompanying supplies and small arms ammunition based on AFPDA planning factors and Class IV based upon OPLOGPLN '97, and 150.6 STON of CTA and other

equipment ("stuff") based upon SEDRE data. With 53 percent of the equipment, ammunition, and supplies needing additional transportation, the heavy brigade is 47 percent mobile. Taking into account only the TOE items, the excess is 18 percent. The 639 STON workload from one heavy brigade represents 2.6 lifts for a non-divisional Medium Truck Company (SRC 55728L100/200) from the Corps, based upon capabilities (60 tractor-semi-trailer combinations) as shown in the charts in Appendix F. This assumes a level one task vehicle availability rate (TVAR) and does not consider combat damage.

Table 9. AOE Mechanized Infantry Brigade (No Cross-Tasked Units)

AOE MECH INFANTRY BRIGADE UNITS	REQUIREMENT (STON)			EXCESS WORKLOAD (STON)			%
	TOE	SAAS	Total	TOE	SAAS	Total	
HHC	15.9	9.4	25.3	8.0	9.4	17.4	69%
Inf(M) Battalions (2)	71.4	95.7	167.2	2.5	70.7	73.3	44%
	71.4	95.7	167.2	2.5	70.7	73.3	44%
Armor Battalion	71.4	70.1	141.4	3.5	58.0	61.5	44%
FSB (1x2)	145.2	50.4	195.5	28.3	32.5	60.8	31%
Brigade Total	375	321	697	45	241	286	41%

Of the 286 STON requiring additional transportation assets in the mech brigade, 45 STON are TOE items. The remaining 241 STON include accompanying supplies and small arms ammunition based on AFPDA planning factors. With 41 percent of the equipment, ammunition, and supplies needing additional transportation assets, the brigade is 59 percent mobile, or less, since these units will also have CTA and other items; however, we did not have enough data to develop an estimate. Taking into account only TOE items, the excess workload is 12 percent.

Table 10. AOE Aviation (ARI) Brigade.

AOE AVIATION (ARI) BRIGADE UNITS	REQUIREMENT (STON)			EXCESS WORKLOAD (STON)			%
	TOE	SAAS	Total	TOE	SAAS	Total	
HHC	22.7	10.6	33.2	13.8	10.6	24.4	73%
Attack Battalions (2)	98.2	37.8	136.0	31.0	29.8	60.7	45%
	98.2	37.8	136.0	31.0	29.8	60.7	45%
Cavalry Squadron	119.3	86.6	205.9	37.7	71.7	109.4	53%
General Support Aviation Bn	85.6	39.3	124.9	39.9	39.3	78.4	63%
Brigade Total	424	212	636	153	181	334	52%

Of the 334 STON requiring additional transportation assets in the aviation brigade, 153 STON are TOE items. The remaining 181 STON include accompanying supplies and small arms ammunition based on AFPDA planning factors. With 52 percent of the equipment, ammunition, and supplies needing additional transportation assets, the brigade is 48 percent mobile, or less, since the Aviation units will also



have CTA and other items; however, we did not have enough data to develop an estimate. Taking into account only TOE items, the excess workload is 36 percent.

The remainder of the heavy division's units are shown in Table 11. The FA Battalion, ADA Battery, Engineer Battalion, and MI Company from the AOE heavy brigade are included within the DIVARTY, ADA Battalion, Engineer Brigade, and the MI Battalion, respectively. Only the larger units are incorporated into the total excess workload.

Table 11. AOE Heavy Division Units (TWV Study)

AOE HEAVY DIVISION UNITS	REQUIREMENT (STON)			EXCESS WORKLOAD (STON)			%
	TOE	SAAS	Total	TOE	SAAS	Total	
Div HHC	27.2	33.4	61.1	0	33.4	33.4	55%
Band	3.1	4.8	7.9	2.3	4.8	7.0	87%
Chemical Company	38.5	20.4	58.9	0	0	0	0%
MP Company	12.2	17.8	29.9	0	14.8	14.8	50%
MI Battalion	80.8	45.1	126.0	7.9	17.6	25.5	20%
ADA Battalion	118.0	74.0	192.0	46.3	74.0	120.4	63%
Signal Battalion	159.2	79.7	238.9	67.5	79.7	147.2	62%
DIVARTY	323.3	290.3	613.6	80.2	290.3	370.5	60%
Engineer Brigade	201.0	161.2	362.1	18.2	161.2	179.4	50%
DISCOM (Less FSBs)							
HHC	20.3	24.8	45.1	.9	24.8	25.7	57%
MSB	359.6	129.6	489.2	0	72.6	72.6	15%
DASB	255.2	66.7	322.0	93.0	66.7	159.7	50%
Total	1598	948	2547	316	840	1156	45%

The remaining division units have an overall excess workload of 45 percent. Taking into account only TOE items, the dependency upon additional transportation assets is 20 percent.

## Part II: Force XXI Evaluation.

No estimate was made for Class IV. In addition, the AOE estimate for CTA and other equipment ("stuff") can not be extrapolated directly from an AOE brigade to Force XXI due to the significant changes in force structure. Thus, the following calculated excess workloads should be viewed as conservative estimates.

Due to the shifting of support assets from the maneuver units to the supporting FSCs and the makeup of the remaining assets, nine of 16 HMMWVs and eight of 16 HMMWVs were designated and used as cargo carriers in the HHC for the Armor heavy brigade and the Mech heavy brigade, respectively. HMMWVs were not included as cargo carriers in the other units. There are no HEMTTs or HEMATs in these Force XXI maneuver units (Table 5) and the ammunition for major weapon systems is not figured into the movement requirements for these units.

Tables 12 and 13 show the requirements and excess workload in STON for units in the Force XXI Armor heavy brigade and Mechanized heavy brigade, respectively. The requirement and excess workload are broken out by TOE items and the accompanying SAAS. The percentage of the total requirement which needs additional transportation assets is displayed in the last column. Totals may not be exact due to rounding.

Table 12. Force XXI Armor Heavy Brigade.

FORCE XXI ARMOR HEAVY BRIGADE UNITS	REQUIREMENT (STON)			EXCESS WORKLOAD (STON)			
	TOE	SAAS	Total	TOE	SAAS	Total	
HHC, Armor	5.8	11.4	17.2	.7	11.4	12.0	70%
Armor Battalions (2)	11.0	44.8	55.7	0	39.9	39.9	72%
	11.0	44.8	55.7	0	39.9	39.9	72%
Infantry (Mech) Battalion	11.6	52.3	63.9	0	45.4	45.4	71%
Recon Troop	3.4	8.6	11.9	1.8	8.6	10.4	87%
Brigade Total	43	162	205	3	145	148	72%

Of the 148 STON requiring additional transportation assets in the Force XXI Armor heavy brigade, 3 STON are TOE items. The remaining 145 STON include accompanying supplies and small arms ammunition based on AFPDA planning factors. With a 72 percent excess workload, the Force XXI Armor heavy brigade is 28 percent mobile. Taking into account only TOE items, the brigade is over 93 percent mobile.

Table 13. Force XXI Mechanized Heavy Brigade.

FORCE XXI MECH HEAVY BRIGADE UNITS	REQUIREMENT (STON)			EXCESS WORKLOAD (STON)			
	TOE	SAAS	Total	TOE	SAAS	Total	
HHC, Mech	5.5	11.4	16.9	.5	11.4	11.8	70%
Infantry (Mech) Battalions (2)	11.6	52.3	63.9	0	45.4	45.4	71%
	11.6	52.3	63.9	0	45.4	45.4	71%
Armor Battalion	11.0	44.8	55.7	0	39.9	39.9	72%
Recon Troop	3.4	8.6	11.9	1.8	8.6	10.4	87%
Brigade Total	43	169	212	2	151	153	72%

Of the 153 STON requiring additional transportation assets in the Force XXI Mech heavy brigade, 2 STON are TOE items. The remaining 151 STON include accompanying supplies and small arms ammunition based on AFPDA planning factors. With a 72 percent excess workload, the Force XXI Mech heavy brigade is 28 percent mobile. Taking into account only TOE items, the mech heavy brigade is over 95 percent mobile.

## Conclusions.

None of the force structures analyzed is 100 percent mobile. Non-TOE equipment, small arms ammunition, and accompanying supplies represent a significant portion of the dependency upon additional transportation assets for all units with the exception of the AOE Chemical Company which has no excess workload.

Using a building block approach to develop an estimate for an AOE heavy division consisting of one heavy brigade, two mech brigades, an aviation brigade, and other divisional units, including the DISCOM, the expected dependency upon additional transportation assets would be over 2540 STON, with 645 STON of TOE items and the remaining 1895 STON, accompanying supplies, small arms ammunition, and an amount of CTA or other "stuff." This takes into account only CTA items for the heavy brigade, and thus, can be considered as a conservative rough estimate for the division. The 2540 STON excess workload represents more than ten lifts for a non-divisional Medium Truck Company from the Corps based upon capabilities as shown in the charts in Appendix F. This assumes a level one TVAR for the Truck Company and does not consider combat damage or inoperative vehicles in the other units. Table 14 summarizes the AOE heavy division findings.

Table 14. AOE Heavy Division Summary

AOE HEAVY DIVISION UNITS	REQUIREMENT (STON)			EXCESS WORKLOAD (STON)			%
	TOE	SAAS	Total	TOE	SAAS	Total	
Heavy Brigade* w/ FSB	471	446*	916	86	392*	478*	52%
Mechanized Brigade (2) w/FSBs	375	321	697	45	241	286	41%
	375	321	697	45	241	286	41%
Aviation Brigade	424	212	636	153	181	334	52%
DISCOM (no FSBs)	635	221	856	94	164	258	30%
Others	963	727	1691	222	676	898	53%
Division Total	3243	2248	5493	645	1895	2540	46%

\*Includes 150.6 STON CTA.

While the TOE excess workload identified for Force XII brigades is small, there are not adequate assets in the maneuver units to accommodate accompanying supplies and small arms ammunition—145 STON for an armor heavy brigade and 151 STON for a mech heavy brigade. We did not have enough information to develop a rough estimate for the Force XXI division as we did for the AOE division; however, with a large portion of equipment, including vehicles and trailers, shifted from maneuver units to supporting CSS units, the DISCOM will have a significant workload dependent upon additional transportation assets.

## Appendix A

### Acronyms

5T	5-Ton
AAR	After Action Reviews
ADA	Air Defense Artillery
AFPD	Army Force Planning Data and Assumptions
AGG	Aggregated
AMMO	Ammunition
AOE	Army of Excellence
AR	Armor
ARI	Aviation Restructure Initiative
ASL	Authorized Stockage List
BB	Break Bulk
BDE	Brigade
BN	Battalion
BTRY	Battery
CAB	Combined Arms Battalion
CAMEX	Computer Assisted Map Exercise
CASCOM	Combined Arms Support Command
CBT	Combat
CCL	Combat Configured Load
CGO	Cargo
CHD	Conservative Heavy Division
CMT	Comment
CNTNR	Container
CSS	Combat Service Support
CTA	Common Tables of Allowances
DASB	Division Aviation Support Battalion
DCD	Director of Combat Developments
DECON	Decontamination
DISCOM	Division Support Command
DS	Direct Support
EAC	Echelons Above Corps
ECF	Equipment Characteristics File
ENG	Engineer
FA	Field Artillery
FORSCOM	Forces Command

FSB	Forward Support Battalion
FSC	Forward Support Company
GEN	General
HEMAT	Heavy Expanded Mobility Ammunition Trailer
HEMTT	Heavy Expanded Mobility Tactical Truck
HETS	Heavy Expanded Transporter System
HHC	Headquarters, Headquarters Company
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HVY	Heavy
INF	Infantry
LIN	Line Item Number(s)
LVL	Level
MDM	Medium
MECH	Mechanized
MHE	Material Handling Equipment
MI	Military Intelligence
MLRS	Multiple Launch Rocket System
MP	Military Police
MSB	Main/Mobile Support Battalion
MTMCTEA	Military Traffic Management Command Transportation Engineering Agency
MTOE	Modified TOE
NR	Non-Roadable
OPLOGPLN '97	1997 release of the Operations Logistics Planner (version 1.40)
PAX	Passengers
PLS	Palletized Load System
PLT	Platoon
PM	Program/Project Management/Manager
POC	Point(s) of Contact
POL	Petroleum, Oil, and Lubricants
R	Roadable
RDS	Requirements Documentation System
RECON	Reconnaissance
SEDRE	Sea-lift Emergency Deployment Readiness Exercise
SMFT	Semi-trailer Mounted Fabric Tank
SRC	Standard Requirement Codes
STLR	Semi-trailer
STON	Short Ton(s)

TARGET	Transportability Analysis Report Generator System
TB	Technical Bulletin
TC	Transportation Corps
TLR	Trailer
TMT	Transportation Motor Transport
TOE	Tables of Organization and Equipment
TRAC-LEE	TRADOC Analysis Center - Fort Lee
TRAC/STLR	Tractor-Semi-trailer Combination
TRADOC	Training and Doctrine Command
TRKS	Trucks
TVAR	Task Vehicle Availability Rate
TWVRMO	Tactical Wheeled Vehicle Requirements Management Office
USAFMSA	U.S. Army Force Management Support Agency
USAARMC	U.S. Army Armor Center
USATSCH	U.S. Army Transportation School
VEHCAR	Vehicular Cargo Model

## Appendix B

### References

MTMCTEA Reference 94-700-5, Deployment Planning Guide (Transportation Assets Required for Deployment), July 1997.

MTMCTEA Reference 92-700-2, Logistics Handbook for Strategic Mobility Planning, August 1997.

Technical Bulletin (TB) 55-46-1, Standard Characteristics (Dimensions, Weight, and Cube) For Transportability of Military Vehicles and Other Outsize/Overweight Equipment (In TOE Line Item Number Sequence), January 1997.

Catalog of U.S. Army Tactical Wheeled Vehicles, Tactical Wheeled Vehicle Requirements Management Office (TWVRMO), January 1996.

HMMWV Program Management (PM) Office: High Mobility Multipurpose Wheeled Vehicle (HMMWV) variations and trailers not in TB 55-46-1 or the TWVRMO Catalog.

Battalion, Brigade, Division Logistics Pocket Battle Book, 1995.

USAARMC: SRC for a Heavy Brigade, vehicles dedicated to hauling ammunition in the Armor Battalions.

USAFMSA: TOE equipment listings.

CASCOM, DCD for Transportation, Mr. Joe Fortner:

Cargo density in pounds per cubic foot, by each Class of Supply and consolidated (with and General without Class V).

Truck capacity in terms of functional volume for 5-Ton cargo truck, 34-Ton semi-trailer, 22.5-Ton semi-trailer, and PLS/PLS flatrack.

TVAR and Capacity Data for Trucks in TC Divisional Truck Unit SRC, 13 July 1995.

TVAR and Capacity Data for Trucks in TC Non-Divisional Truck Unit SRC, 13 July 1995.

Non-Divisional TC Truck Company SRC Capability Data, 13 July 1995.

Divisional TC Truck Company SRC Capability Data, 13 July 1995.

1997 release of the Operations Logistics Planner (OPLOGPLN '97) (version 1.40): Class IV, Barrier and Construction materials, 2 day consumption.

Combat Service Support Battle Lab Initiative Palletized Load System Distribution Analysis, Main Report, 30 December 1993: Appendix A, Table 5.

TRAC-LEE, Tactical Wheeled Vehicles (TWV) Study, Emerging Results, May 1998.



DEPARTMENT OF THE ARMY  
U.S. ARMY TRANSPORTATION CENTER  
FORT EUSTIS, VIRGINIA 23604-5000



REPLY TO:  
ATTENTION OF:

ATZF-CG

MAR 14 1996

MEMORANDUM FOR DIRECTOR, TRADOC ANALYSIS COMMAND - LEE, ATTN:  
ATRC-L, 401 FIRST STREET, FORT LEE, VA 23801

SUBJECT: Battlefield Mobility Study

1. The recent Computer Assisted Map Exercise (CAMEX) conducted at Ft Lee, 4-13 Mar 96, identified a substantial transportation requirement to relocate units on the battlefield. The real bill for transportation could not be identified because the mobility of individual units is unknown.
2. Request TRAC-Lee initiate a study to determine the mobility of all units, by SRC, in the Division XXI. This study must include all equipment that will need to be transported to include TOE equipment, CTA equipment, and unit impedimenta. Further request you complete the study by October 96 so the results may be evaluated as part of the Division Redesign.
3. The CASCOM POC is Kathie O'Neill, DSN 687-0358.

DANIEL G. BROWN  
Major General, USA  
Chief of Transportation



**Appendix C**  
**Original Methodology and Preliminary Findings**

**Transportability on the Battlefield**

**Purpose.** The purpose of this analysis is to ascertain whether units have the capability to move themselves on the battlefield and, if not, identify the shortfalls.

**Background.** Based upon questions which arose during the CSS CAMEX AAR with respect to the mobility of units on the battlefield, MG Brown, Chief of Transportation, requested that TRAC-LEE undertake an analysis of battlefield mobility/transportability.

**Scope.**

After discussions with CASCOM POC, we decided to analyze the mobility of a heavy brigade (Table C-1). Due to the level of detail needed—complete equipment and vehicle lists by LIN—we used current (1997) AOE TOE. This AOE evaluation is Part I of the analysis and is covered by this report. The transportability data for this analysis was developed independently from TOE header information on unit mobility.

Table C-1. AOE Heavy Brigade

SRC	DESCRIPTION	PERSONNEL (3752)
87042L100	Headquarters, Headquarters Company, Armor Brigade	81
17375L000	Armor Battalion (2)	604 x 2
07245L200	Infantry Battalion (Mechanized)	825
05335L000	Engineer Battalion	444
06365L100	Field Artillery Battalion 155mm Self-Propelled	564
34397A000	Military Intelligence Company (Direct Support)	40
44177L100	Air Defense Artillery Battery	113
63005L100	Forward Support Battalion (2 X 1)	436
03157L200*	Decon Platoon from Chemical Company	20
19333L000*	Direct Support Platoon from Military Police Company	21

\* Company SRC.

**Assumptions.**

The per soldier planning factors for accompanying small arms ammunition and accompanying supplies and equipment from the MTMCTEA Deployment Planning Guide (MTMCTEA Reference 94-700-5) are reasonable estimates of what the unit will have on hand. (See Table 2 in the Main Report.) These planning factors do not include the soldiers' gear which, at two duffle bags (or a duffle and a foot locker) per soldier, can require a significant amount of space—over ten cubic feet per soldier.

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The weight and volume for those items on the TOE for which MTMCTEA had no data are either not significant, or are included within, or mounted on, other end items. The estimates of weight and volume developed by MTMCTEA for the “aggregated” TOE items account for the remainder of the TOE equipment; the volume of the aggregate, in terms of specified square feet stacked 96 inches high, can be translated into cubic feet.

**Cargo Vehicle Load Limits**—weight, height, and cube—from TB 55-46-1, Standard Characteristics (Dimensions, Weight, and Cube) For Transportability of Military Vehicles and Other Outsize/Overweight Equipment (In TOE LIN Sequence) represent optimal capacity. According to the TB, the weight is the manufacturer’s off-road rated load capacity in pounds. Height—not used in this analysis—and cube are the maximum loading height, in inches, and the related cargo compartment cubic capacity, in cubic feet.

The AOE FSB has several vehicles listed in TB 55-46-1 as having no cargo capacity. We assumed that they account for the ASL, so these vehicles are not included in the capabilities totals, although they are identified on the “Other” list, and the ASL is not included in the requirements.

**Limitation.** Estimates for the AOE Chemical Decontamination (DECON) Platoon (PLT) and the Military Police (MP) Platoon (DS) are extrapolations from the Chemical Company and MP Company, respectively, and are based solely upon the number of soldiers in the platoons.

#### **Methodology.** (Figure C-1)

**Units and Equipment.** After identifying the force structure and SRC for the units of interest, we requested detailed TOE equipment and personnel listings for those SRC from USAFMSA. We provided the unit lists of equipment by LIN to MTMCTEA. They, in turn, pulled weight and volume information from their databases. The LIN level of detail was necessary since the MTMCTEA data identified only by SRC reflects actual FORSCOM MTOE which vary from the TOE. The data from MTMCTEA was in five sections for each unit. The first section provided an overall weight and volume for the entire unit including vehicles, trailers, and factors for supplies and small arms ammunition. The second section provided the weight and cubic feet, along with the external dimensions, for major end items and individual items (by LIN) larger than 72 inches wide by 72 inches long by 35 inches high, including vehicles and trailers. The next section was a list of LIN for which MTMCTEA had no data. Most of these items are either small enough to be inside something else or are things, such as radios, which are permanently mounted on another piece of equipment. The last section provided the aggregated weight and square feet for the remainder of the LIN in the unit, assuming that everything was packed and stacked to a height of 96 inches.

**Vehicle and Trailer Capacities.** TB 55-46-1 includes maximum cargo capacity in terms of weight and dimensions, as well as the exterior dimensions and overall weight, for many LIN. To ensure consistency, this was cross-checked against the MTMCTEA data, which identified vehicles and trailers as roadable (R) or nonroadable (NR), e.g., tracked vehicles, and provided their exterior dimensions. We developed spreadsheets incorporating the cargo capacity per vehicle or trailer in the brigade. Since some of these items have no measurable cargo capacity, we divided the vehicle/trailer list into two parts to simplify calculations. These detailed lists of the brigade’s vehicles and trailers are available from TRAC-LEE upon request.

## Appendix C

### Original Methodology and Preliminary Findings

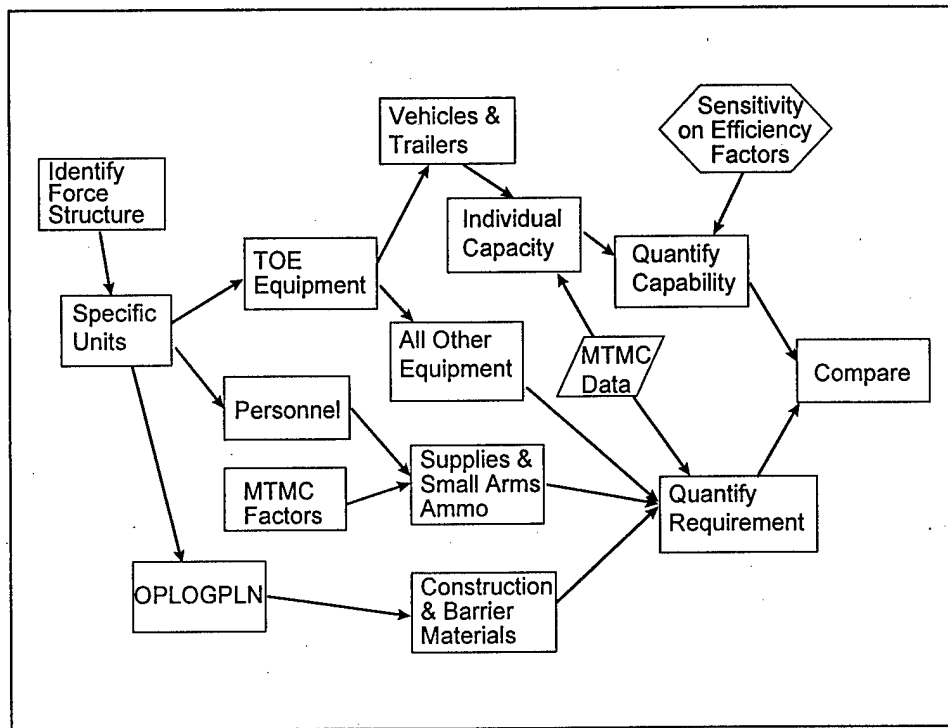


Figure C-1. Basic Methodology (AOE)

**Capability.** Each unit's capability is the sum of the cargo capacities of the vehicles and trailers in that unit. These capabilities in terms of weight and volume, along with the quantity of vehicles and trailers in each unit, are included as Attachment I. Each Armor Battalion has 15 HEMTTs identified as dedicated to ammunition. The Field Artillery Battalion has 15 PLS trucks and 18 Tracked Ammunition Carriers dedicated to ammunition. These vehicles are not included in the capabilities totals; nor is the major weapon system ammunition figured into the requirements for these units.

**TOE Items, Weight and Volume.** For each unit, the MTMC/TEA data for large items was summed and added to the aggregate values and the other requirements (see below) to obtain a weight and volume figure for that unit. Since the data was aggregated at the company level or higher, one sixth of the MP Company aggregate values were allotted to the MP platoon assigned to the brigade. Similarly, one seventh of the Chemical Company aggregate values were allotted to the Chemical DECON platoon. A sample (Armor Battalion) of the unit spreadsheets showing these detailed equipment lists is included as Attachment II. The remainder of the unit spreadsheets are available from TRAC-LEE upon request.

**Other Requirements.** Weight and volume figures for supplies and equipment and for small arms ammunition were added to each unit's requirements. In addition, a weight and volume estimate for construction and barrier materials (Class IV) was added to the Engineer Battalion requirements.

**AOE Comparison.** For each unit in the brigade, we compared the total weight capability of the vehicles and trailers to the sum of the weights of all identified requirements. We also compared the total volume capability to the sum of the volumes of all identified requirements. Any shortfall—weight or volume total requirement greater than capability—was highlighted.

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Sensitivity. There are two aspects to the sensitivity analysis. The first reflects the fact that almost every type of cargo cubes out before it weights out. The second addresses efficiency of packing.

We varied the usable weight capacity from 100 percent to 20 percent of the manufacturer's off-road rated load capacity in pounds as stated in the TB and compared the results to the total weight requirement for each unit. The PLS and Class V provide a vivid, straight-forward example of weight utilization. The following examples are taken from the Main Report of the PLS Distribution Analysis. The manufacturer's off-road rated load capacity is 33,000 pounds. The PLS cargo bed is 20 feet long by 8 feet wide. The number of cubic feet which can be accommodated depends upon how high the cargo is stacked. The PLS can accommodate four Multiple Launch Rocket System (MLRS) pods of six missiles each which total approximately 10.16 STON or 20,320 pounds—about 62 percent utilization by weight—and occupy approximately 510 cubic feet. Pallets of other types of ammunition yield similar results. For other classes of supply, the utilization rate by weight decreases significantly since the stacked height of the cargo will vary only slightly—three to five feet—and not necessarily proportionally, while the cargo density decreases. The PLS Distribution Analysis found that a full load of mail—sixteen pallets—weighed in at only 3.24 STON. As an additional frame of reference, the Deployment Planning Guide estimates a 55 percent container utilization by weight.

For volume, we varied the cargo compartment cubic capacity from 100 percent to 70 percent of that stated in the TB, and compared the results to the total volume requirement for each unit. A perfect cargo space would have no odd angles, no wheel wells protruding into the cargo bed, and would match the contour and size of the cargo to be loaded. Perfect cargo would come in cubic foot packages all neatly stacked. Much of the analysis is based upon MTMCTEA data which presupposes that the cargo is configured for shipping, however units on the battlefield do not have the luxury of having everything neatly containerized every time they move. As a frame of reference, the Deployment Planning Guide identifies 75 percent as the average stow factor—cargo space used divided by gross cargo space—for ship transport and the PLS example above utilizes just over 70 percent of the cube listed in the TB (721 cubic feet). CASCOM sets the functional volume available on a PLS as 640 cubic feet for an 80 percent utilization rate in the case of the MLRS pods.

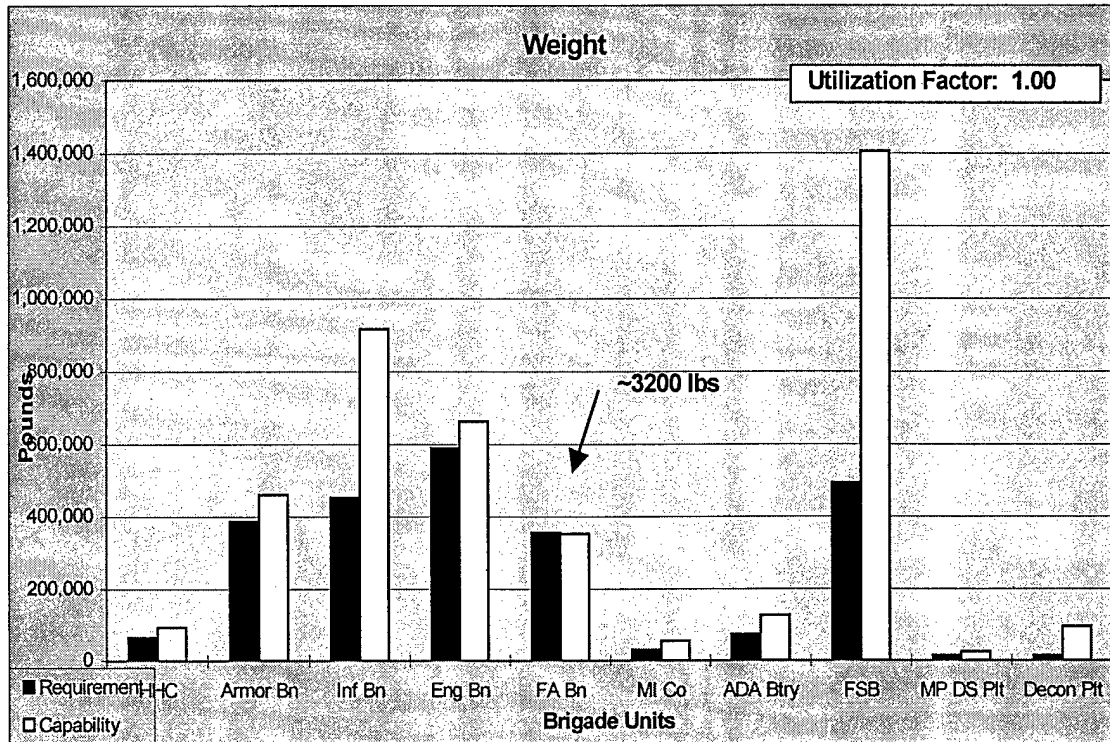
A full set of sensitivity charts displaying requirements versus capabilities and the numeric data used to develop the bar charts are available upon request. The findings below highlight representative values.

#### **Findings.**

While the AOE Heavy Brigade units analyzed—with the exception of the Field Artillery Battalion—appear to have sufficient capability based upon tonnage (Figure C-2), the same does not hold true for requirements in terms of volume (Figure C-3). Based upon volume capability, the Armor and Engineer battalions, as well as the MP Platoon, join the Field Artillery Battalion in shortfalls ranging from five to eight percent for the Armor battalion to about fifty percent for the Engineers. If the Class IV materials are eliminated from the Engineer battalion's requirements, the shortfall is reduced to a little over 40 percent. A utilization factor of 1.00 means that 100 percent of the available capacity is used.

## Appendix C

### Original Methodology and Preliminary Findings



While the requirements for the units remain fixed, each figure uses a different scale due to the dramatic shifts in capabilities.

Figure C-2. AOE Heavy Brigade Weight Comparison

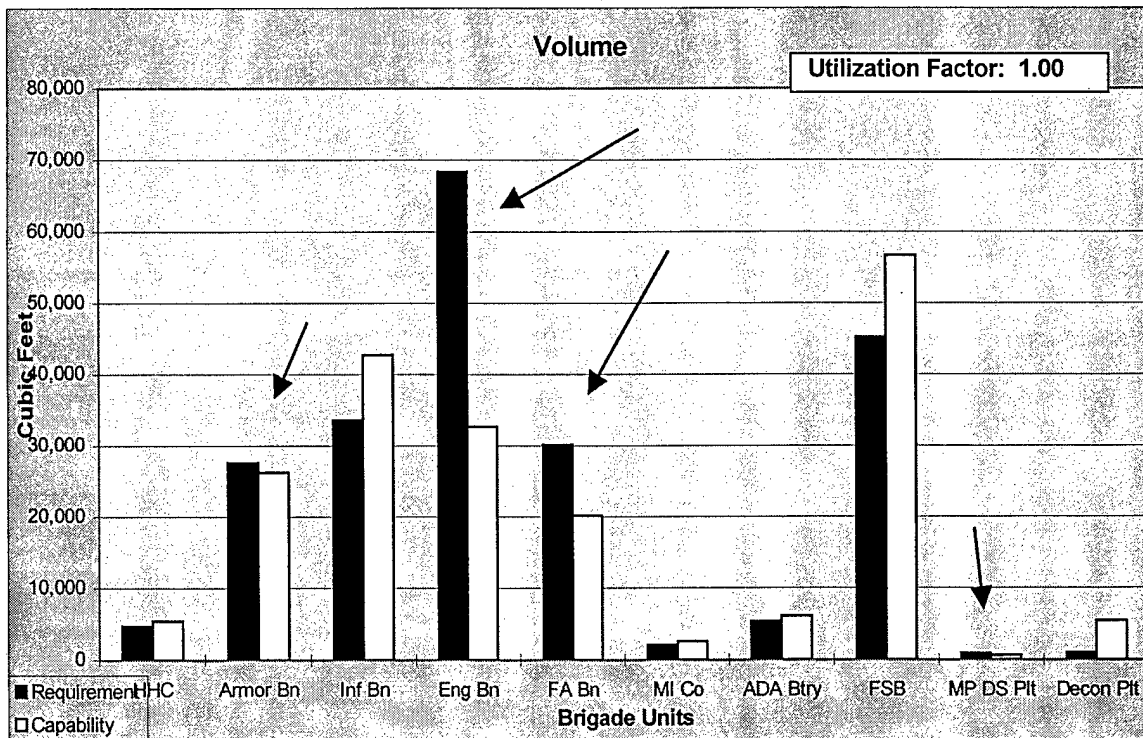


Figure C-3. AOE Heavy Brigade Volume Comparison

## Appendix C

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In addition, if we take into account an efficiency factor, the capabilities decrease. Figures C-4 and C-5 depict the effects of reducing the efficient utilization of the cargo carrying capability by just ten percent for weight and five percent for volume, respectively. Realistically, considering the average cargo densities shown in Table 5 of the main report, the degradation may be closer to 50 percent by weight (Figure C-6). Since units do not move about on the battlefield with all their equipment packed in containers, a degradation of 25 percent by volume is conceivable (Figure C-7). In any case, just expressing the requirements and capabilities in terms of weight does not show the whole picture, especially in the FSB where it appears to have adequate capability by weight even at a 50 percent utilization rate.

While the requirements for the units remain fixed, **each bar chart uses a different scale** due to the dramatic shifts in capabilities. There are 18 PLS flatracks in the FSB which has only three PLS trucks and three trailers. To move eighteen loaded flatracks would require the six platforms to make three trips each. If they are not loaded, they can be stacked, but that would still tie-up the platforms for a trip. Either way they have an impact upon the FSB's mobility. These flatracks were not included in the requirement or the capability figures.

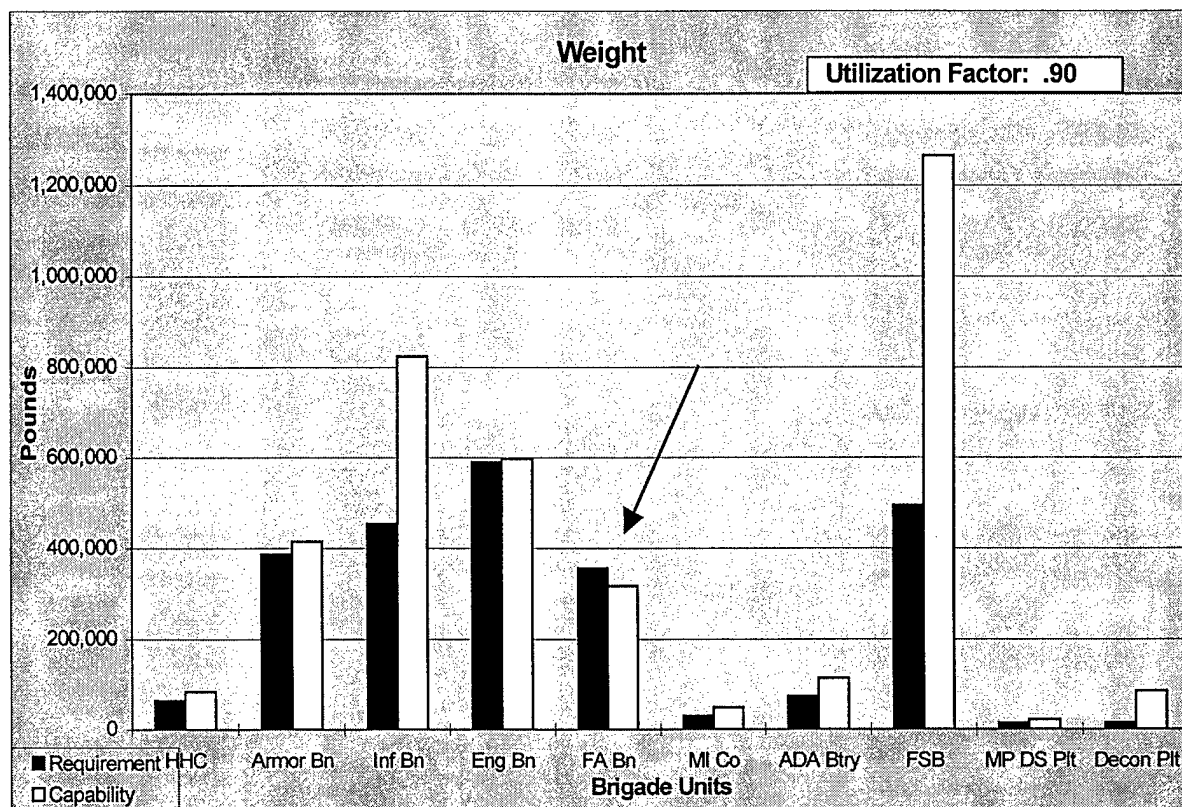


Figure C-4. AOE Heavy Brigade 90% Weight Utilization

# **Appendix C** **Original Methodology and Preliminary Findings**

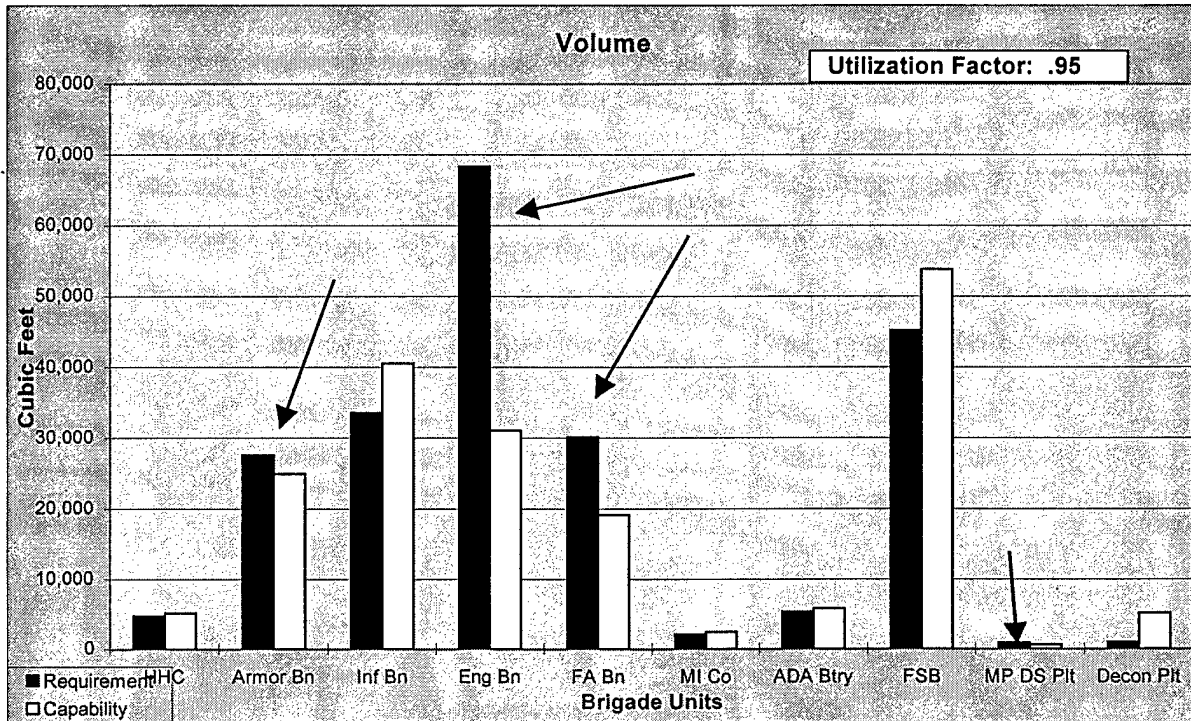


Figure C-5. AOE Heavy Brigade 95% Volume Utilization

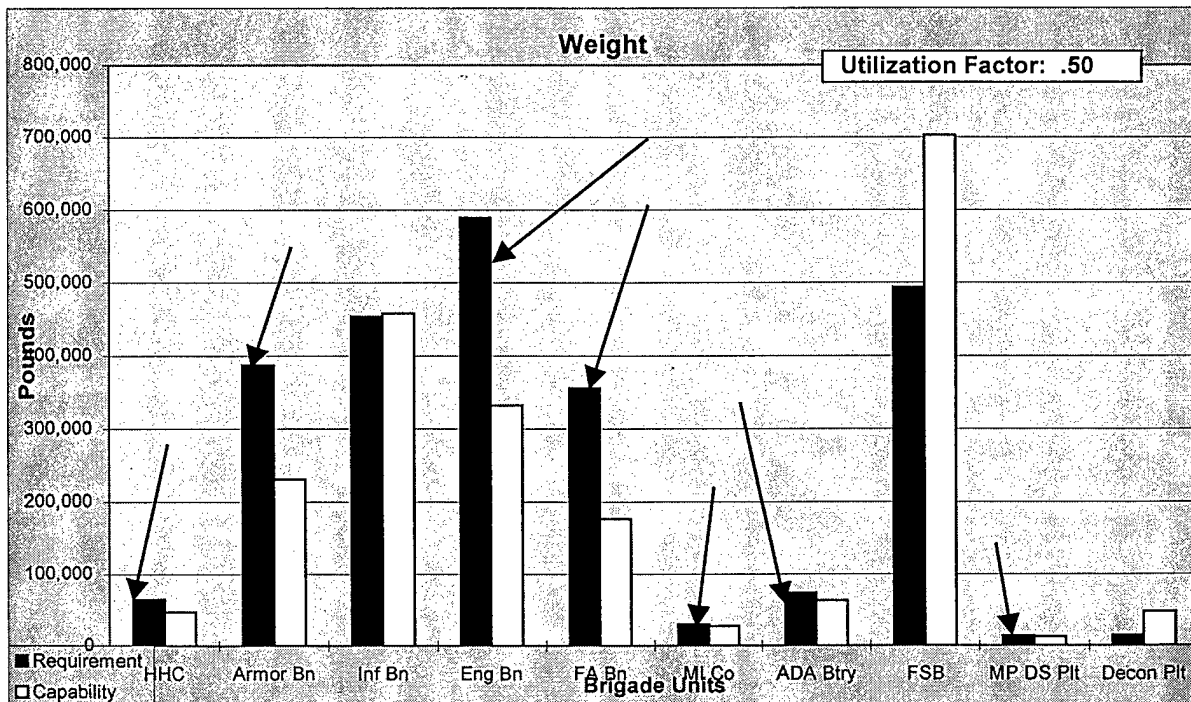


Figure C-6. AOE Heavy Brigade 50% Weight Utilization

## Appendix C

### Original Methodology and Preliminary Findings

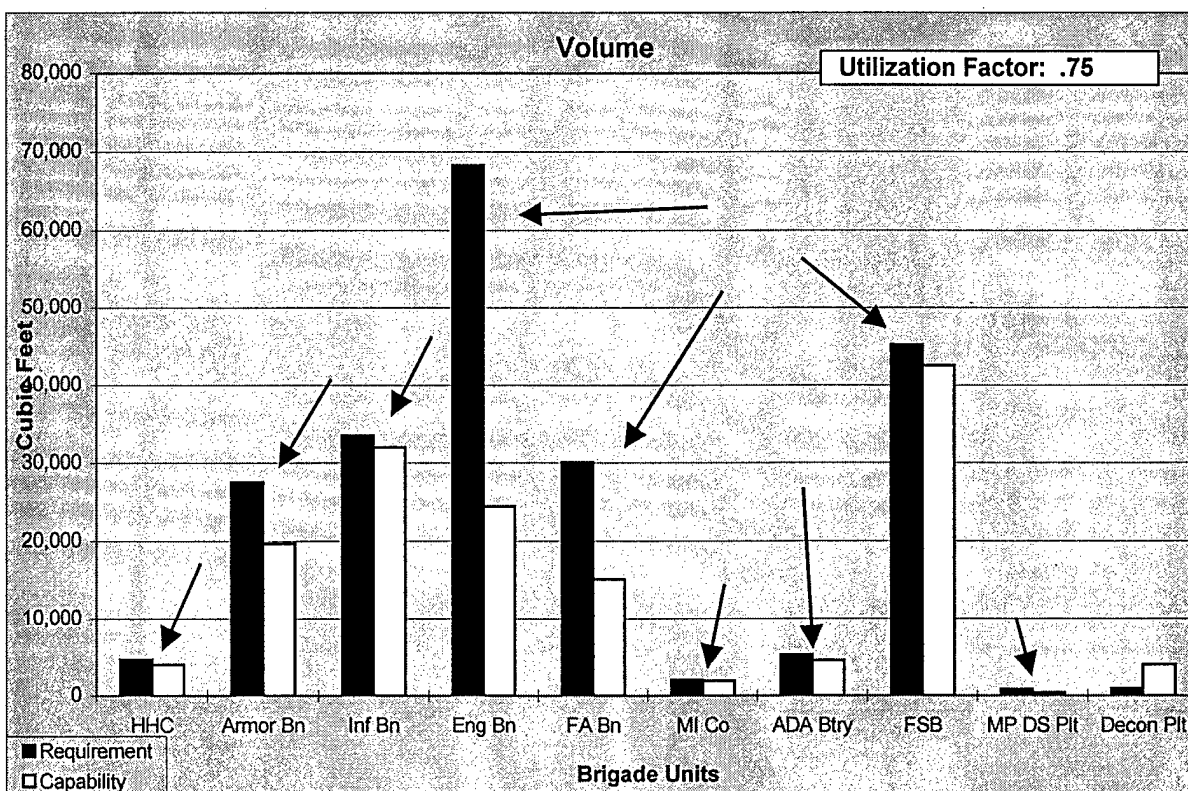


Figure C-7. AOE Heavy Brigade 75% Volume Utilization

#### Conclusions.

The available data imply that the AOE TOE were built based upon the advertised weight capacity of the vehicles and trailers. This may not be an advisable strategy given that all loads, except for a few types of ammunition, cube out before they weight out.

Current estimates of unit mobility/transportability on the battlefield are overly optimistic. Such estimates increase the risks given the unexpected strain on the CSS system which is expected to support the maneuver units.



# Attachment I, Appendix C

## Sample Data - Armor Battalion Capability

SRC	Unit Nomenclature	No. Units	Pers	Unit Capabilities		LIN	Quantity	Optimal Total Capacity	
				AOE Heavy Brigade	Vehicle/Trailer Description			Max Weight (Pounds)	Max Cube (Cubic Feet)
17375L000	Tank Battalion (HvyDiv)	2	604	Carrier Personnel full tracked, Armored (Rise)	M113A3	NR C18234	13	40560	975
17376L000	HHC, Tank Bn	1		Carrier Command Post, Light Tracked	M577A1	NR D11538	5	15000	2000
17377L000	Tank Company	3		Kitchen Field, Trailer Mounted	MFK75A	R L28351	1	3000	250
				Truck Utility, Cargo/Troop Carrier 1-1/4 ton 4X4 W/E (HMMWV)	M998	R T61494	29	72500	3016
				Truck Utility, Cargo/Troop Carrier 1-1/4 ton 4X4 W/E W/W (HMMWV)	M1038	R T61562	1	2500	104
				Truck Wrecker, Tactical 8X8 Heavy Expanded Mobility w/Winch	M984	R T63093	1	200	40
				Trailer Cargo, LMTV w/Dropsides	M1082	R Z36068	19	95000	7410
				Trailer Cargo, High Mobility 1-1/4 ton	M1102	R Z36204	2	5680	320
				Trailer Cargo, High Mobility 3/4 ton	M1101	R Z36272	4	8160	420
				Truck Cargo, 4X4 LMTV W/E	M1078	R Z40430	24	120000	7992
				Truck Cargo, 4X4 LMTV W/E W/W	M1078	R Z60951	5	25000	1665
				Truck Utility, Expanded Capability 4X4 W/E HMMWV	XM1113	R Z62562	2	10200	208
				Truck Utility, ExpCapUp-Armed Armt Carrier 4X4 W/E HMMWV	XM1114	R Z62630	10	23000	250
				Trailer Cargo, MTV w/Dropsides	M1095	R Z90712	1	10000	445
				Truck Cargo, MTV w/MHE W/E	M1084	R Z93626	3	30000	1140
				<b>Total</b>				<b>460800</b>	<b>26235</b>
				Other					
				Truck Cargo Tactical 10T 8X Hvy Exp Mob W/W W/Lt Crane	M977 (HEMTT)	R T39518	5	Dedicated to ammo	
				Truck Cargo, Tactical 8X8 Heavy Exp Mobility w/Lt Crane	M977 (HEMTT)	R T59278	10	Dedicated to ammo	
				Carrier 120MM Mortar, Self-propelled Armor	M1064	NR C10990	6		
				Carrier Armored Command Post, full tracked	M1068	NR C11158	3		
				Cleaner Steam Pressure Jet Trailer Mounted on modified	M116A2 Chassis	R C32887	1		
				Field Feeding Kitchen Co. Level		R K28601	4		
				Mortar 120mm K6A1		R M68405	6		
				Tank Combat Full Tracked, 120MM Gun, M1A2		NR T13305	58		
				Truck Tank, Fuel Servicing 2500 Gal 8X8 Heavy Exp Mobility	M978	R T87243	16		
				Welding Shop Trailer Mounted, Oxy-Acet/Elec Arc		R W48391	1		
				Trailer Tank, Water 400 Gal 1-1/2 ton 2 Wheel W/E	M149A2	R W98825	8		
				Armored Maintenance Vehicle		NR Z06157	4		
				Recovery Vehicle Full Tracked, M88A1E1 (IRV)		NR Z62381	7		
				Truck Tank, POL MTV W/E	M1091	R Z94047	1		
				Truck Wrecker, MTV W/W W/E	M1089	R Z94433	1		

### Sample Data - Armor Battalion Requirements

C-11-1

# Attachment II, Appendix C

## Sample Data - Armor Battalion Requirements

LIN	DESCRIPTION	ARMOR BATTALION (HVV DIV) 17375L000 (Two Battalions in the Brigade)										Each			Total			Each			Total		
		ALO1	L	W	H	Weight (Pounds)	Sq Ft	Short Tons	Weight (2K)	Cube	No Data	Weight (Pounds)	Cube	Total	Weight (2K)	Cube	No Data	Weight (Pounds)	Cube	Total			
J88547	INSTALLATION KIT ELECTRONIC EQUIPMENT: MK-2565/VRC-97	1																					
K23814	HEADSET-MICROPHONE: H-182/PT	6																					
K27594	KIT GROUND HOP: M1 TANK	6																					
K47623	KY-99: MINTERM	4																					
K52926	HOSE ASSEMBLY: NONMETALLIC WATER USE W/PIN ORROCKER LUGWRENCHING	6																					
K53748	HOSE ASSEMBLY: NONMETALLIC FUEL/OIL HYDROCARBON USE BRASS FITTIN	28																					
L44595	LAUNCHER GRENADE 40 MILLIMETER: SGLE SHOT RIFLE MTD DTCHBLE W/E	18																					
L44748	LAUNCHER GRENADE ARMAMENT SUBSYSTEM: SCREEN RP M259	8																					
L63994	LIGHT SET GENERAL ILLUMINATION: 25 OUTLET (ARMY)	2																					
L64131	LIGHT SET MARKER EMERGENCY: AIR FIELD RUN WAY PTBL BATTERY OPRTD	5																					
L67964	LIGHTWEIGHT DIGITAL FACSIMILE: AN/UXC-7	2																					
L91975	MACHINE GUN CALIBER .50: HB FLEXIBLE (GROUND AND VEHICLE) W/E	105																					
L92352	MACHINE GUN 7.62 MILLIMETER: FIXED	116																					
L92386	MACHINE GUN 7.62 MILLIMETER: LIGHT FLEXIBLE	5																					
M09009	MACHINE GUN 5.56 MILLIMETER: M249	5																					
M12418	MASK CHEMICAL BIOLOGICAL: M40	247																					
M14381	MAST: AB-903/G	1																					
M18526	MASK CHEMICAL BIOLOGICAL: COMBAT/VEHICLE M42	357																					
M60449	MULTIMETER DIGITAL: AN/PSM-45	7																					
M74364	MOUNT GUN: RING CAL .50	20																					
M74849	MINI EYESAFE LASER INFRARED OBSERVATION SET (MELIOS): AN/PVS-6	10																					
M75577	MOUNT TRIPOD MACHINE GUN: HEAVY CALIBER 50	42																					
M75714	MOUNT TRIPOD MACHINE GUN: 7.62 MILLIMETER	5																					
M92362	MACHINE GUN GRENADE 40MM: MK19 MOD III	5																					
N02758	NET CONTROL DEVICE NCD: KYX-15/TSEC	13																					
N05050	NIGHT VISION SIGHT SET: AN/UAS-11	2																					
N05482	NIGHT VISION GOGGLE: AN/PVS-7B	420																					
P06148	PLATOON EARLY WARNING SYSTEM: AN/TRS-2(V)	14																					
P07900	PLOTTING BOARD INDIRECT FIRE: AZIMUTH	10																					
P40750	POWER SUPPLY: PP-6224/U	2																					
P49587	PJH SURFACE VEHICLE RADIO SET: AN/VSQ-2(V)1 (PJH)	6																					
P70517	PURGING KIT FIRE CONTROL: ORG MAINT	6																					
P81748	PROTRACTOR FAN RANGE DEFLECTION: AL 1 TO 50000 METER RANGE	2																					
P91756	PUMP CENTRE: GAS DRVN FRAME MTD 1-1/2 IN 65GPM 50 FT HD	2																					
P95280	PUMP UNIT: CENTRIFUGAL CAPTURED-FUEL	19																					
P98152	PISTOL 9MM AUTOMATIC: M9	297																					
Q03468	QUADRANT FIRE CONTROL: GUNNERS	61																					
R20684	RADIAC SET: AN/VDR-2	40																					
R30895	RADIO SET: AN/GRC-213	2																					
R30925	RADIAC SET: AN/PDR-75	5																					
R44863	RADIO SET: AN/VRC-89A	36																					
R45407	RADIO SET: AN/VRC-92A	25																					
R59023	REELING MACHINE CABLE HAND: RL-31	1																					
R59160	REELING MACHINE CABLE HAND: RL-39	58																					
R67160	RADIO SET: AN/VRC-87A	26																					
R67194	RADIO SET: AN/VRC-88A	8																					
R67908	RADIO SET: AN/VRC-90A	31																					
R68010	RADIO SET: AN/VRC-91A	10																					
R83005	RADIO SET: AN/PRC-119A	6																					

## Attachment II, Appendix C

### Sample Data - Armor Battalion Requirements

ARMOR BATTALION (HVV DIV) 17375L000 (Two Battalions in the Brigade)													
LIN	DESCRIPTION	ALO1	Each (Inches)			Weight (Pounds)	Sq Ft	Short Tons	Each Weight (2K)	Cube	No Data	Weight (Pounds)	Total Cube (Cubic Ft)
			L	W	H								
R84904	REPRODUCTION SET DIAZO PROCESS:												
R93169	RADIO TEST SET: AN/PRM-34()	1											
R95035	RIFLE 5.56 MILLIMETER: M16A2	6											
R97234	RIFLE 5 56 MILLIMETER: M4	294											
S35741	SAW CHAIN: GAS DRVN BAR FRAME W/ACCESS/COMPONENTS	142											
S64488	SPEECH SCTY EQUIP DIGITAL SUBSCRIBER VOICE TERMINAL: TSEC/KY-68	2											
T06859	TEST SET: COMMON CORE (STE-M1/FVS)	10											
T25726	TEST SET: COMMON CORE (STE-M1/FVS)	6											
T31872	PHONE-SIGNALING ADAPTER: TA-977( )/PT	1											
T40405	TELEPHONE WIRE WITH REEL: MX-10891/G	11											
T45408	TAPE READER GENERAL PURPOSE: KOI-18/TSEC	16											
T45593	TELEPHONE DIGITAL NON-SECURE VOICE: TA-1035/U	9											
T55957	SIGHT BORE OPTICAL:	2											
T62350	TERMINAL RADIO-TELEPHONE MOBILE SUBSCRIBER: ANVRC-97	2											
U65480	TEST KIT MASK PROTECTIVE: M41	2											
U81707	SURGICAL INSTRUMENT AND SUPPLY SET INDIVIDUAL:	4											
U82529	SWITCHBOARD TELEPHONE MANUAL: SB-22/PPT	2											
U82529	SWITCHBOARD TELEPHONE MANUAL: SB-993/GT	6											
U89185	UTILITY RECEPTACLE:	2											
V30252	TELEPHONE SET: TA-1/PPT	42											
V31211	TELEPHONE SET: TA-312/PPT	46											
V98788	POWER SUPPLY VEHICLE: HYP-57/TSEC	4											
W02526	TESTER AIR FLOW: USED ON VEHICLES W/GAS PARTICULATE FILTER UNITS	5											
W32182	TOOL KIT ARTILLERY MECHANICS: ORD	14											
W33004	TOOL KIT GENERAL MECHANICS: AUTOMOTIVE	54											
W34648	TOOL KIT CARPENTERS: ENGINEER SQUAD W/CHEST	5											
W37483	TOOL KIT ELECTRIC EQUIPMENT: TK-101/GSQ	6											
W51910	TOOL KIT SMALL ARMS REPAIRMAN: ORDNANCE	5											
W68117	TORCH SET CUTTING AND WELDING: MEDIUM DUTY	4											
Y34027	WATCH WRIST: NON MAINTAINABLE	87											
Y86377	WRENCH TORQUE: 3/4 IN SQ MALE DRIVE 600 FT-LB CAPACITY	18											
Z04910	ALARM CHEMICAL AGENT AUTOMATIC: XM22	31											
Z09000	LOGMARST( ) COMMUNICATIONS MODEM GROUP: CY-8538/G	5											
Z15752	COMMAND AND LAUNCH UNIT: (JAVELIN)	5											
Z19989	CAMOUFLAGE SCREENING SYS: ULTRA-LTWT RADAR SCATTERING GEN PURPOSE	579											
Z24522	DRIVER'S VISION ENHANCER:	50											
Z35294	INSTALLATION KIT: MK-XXXXVSQ (M1A2)	4											
Z38272	LIGHTWEIGHT WEAPON SIGHTS: (THERMAL RIFLE SIGHT)	5											
Z38356	LIGHTWEIGHT WEAPON SIGHT: (SQUAD/PLATOON SURVEILLANCE DEVICE)	10											
Z38366	LIGHTWEIGHT WEAPON SIGHT: (THERMAL CREW SERVED WEAPON SIGHT)	100											
Z49303	DIGITAL DATA SET: AN/PSG-7 (V)1	69											
Z50144	LOGMARST( ) MICROPROCESSOR GROUP: CY-8537/G	5											
Z51550	IK CARRIER COMMAND M-577A1: MK-2219	2											
Z75367	POCKET RADIAIC:	33											
	Aggregated (Items< 72x72x35) stacked 96" high					211861	1261	106				211861	10088
	Subtotals												
	No data												
C18297	COMPUTER SET GENERAL: AN/GYK-33A	1											
M23673	MEDICAL EQUIPMENT SET CHEMICAL AGENT PATIENT TREATMENT:	2									X		
M25865	MEDICAL EQUIPMENT SET CHEMICAL AGENTS PATIENT DECONTAMINATION:	1									X		

# Attachment II, Appendix C

Sample Data - Armor Battalion Requirements

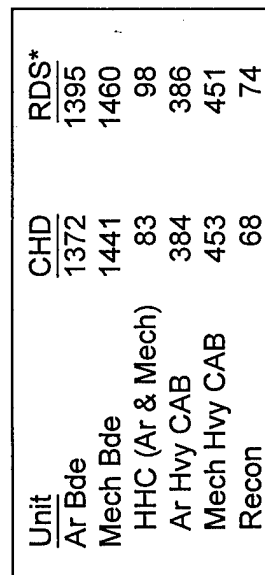
LIN	DESCRIPTION	ARMOR BATTALION (HVV DIV) 17375L000 (Two Battalions in the Brigade)				Each			Total			Each			Total		
		ALO1	L	W	H	Weight (Pounds)	Sq Ft	Short Tons	Weight (2K)	Cube	No Data	Weight (Pounds)	Cube	No Data	Weight (Pounds)	Cube	No Data
M26413	MEDICAL EQUIPMENT SET GROUND AMBULANCE:	8															
M30156	MEDICAL EQUIPMENT SET SICK CALL FIELD (2):	2															
M30499	MEDICAL EQUIPMENT SET TRAUMA FIELD (2):	2															
T62405	TOOL SET BATTALION MAINTENANCE TEAM: ARMORMECH INF/FLD ARTY	4															
T77499	TEST SET ELECTRONIC SYSTEMS: AN/PSM-80(V)2	6															
T77567	TEST SET ELECTRONIC SYSTEMS: AN/PSM-80(V)3	5															
Z09773	BASE STATION LIGHTWEIGHT SYS: LVRS	3															
Z10767	BINOCULAR: STABILIZED XM25	68															
Z11021	BORISIGHTING EQUIPMENT WEAPON: SMALL ARMS XM30	5															
Z17296	COMPUTER SET: DIGITAL AN/TYQ-53	1															
Z19791	COUNTERMEASURES SET: AN/VLQ-6	58															
Z23386	DISCHARGER GRENADE: COUNTERMEASU	320															
Z28333	FREQUENCY HOPPING MULTIPLEXER: (FHMUX)	2															
Z32566	MISSILE SIMULATION ROUND: (MSR) (AAWS-M)	5															
Z36072	KEY PROCESSOR KP TSEC/KOK-22	1															
Z36291	KIT ARMOR: M113A3 APC BLOCK II MODIFICATION	13															
Z37940	LASER COUNTERMEASURE SYSTEM: AN/PLQ-XX	10															
Z38190	LASER COUNTERMEASURE SYSTEM: AN/PLQ-4()	10															
Z44778	MONOCULAR NIGHT VISION DEVICE	2															
Z44784	MORTAR BALLISTIC COMPUTER: XM30	4															
Z45663	MOUNT MACHINE GUN PURPOSE: MK93 MOD1	5															
Z46135	COMMON HARDWARE MANEUVER CONTROLSYSTEM: (CHMCS)	2															
Z48177	OUT STATION: VIDEO SYSTEM (LVRS)	6															
Z55070	KIT: VEHICULAR EQUIPMENT COMPONENTS HMMWV SCOUT	10															
Z63141	MAST ANTENNA 10 METERS: AB-XXX	10															
Z70236	NAVSTAR GPS PRECISION LIGHTWEIGHT GPS RECEIVER: (PLGR)	127															
Z73265	SIGHT REFLEX: COLLIMATOR XM68	30															
Z91758	TRAINER SUBCALIBER 120MM MORTAR:	6															
Z98001	WATER HEATER: MOUNTED RATION	106															
Vehicles and Trailers																	
C10990	CARRIER 120 MILLIMETER MORTAR: SELF PROPELLED ARMORED	6	210	106	80	27635	927	83	13.8175	1031							
C11158	CARRIER ARMORED COMMAND POST: FULL TRACKED	3	194	106	102	23950	428	36	12.765	1183							
C18234	CARRIER PERSONNEL FULL TRACKED: ARMORED (RISE)	13	208	100	81	23880	1878	155	11.94	975							
C32887	CLEANER STEAM PRESSURE JET TRAILER MOUNTED:	1	100	72	89	2780	50	1									
D11538	CARRIER COMMAND POST: LIGHT TRACKED	5	192	100	104	22415	667	56	11.2075	1156							
L28351	KITCHEN FIELD TRAILER MOUNTED: MTD ON M103A3 TRAILER	3	178	93	94	4200	345	6									
M68405	MORTAR 120 MILLIMETERS:	6	95	60	45	720	238	2									
T13305	TANK COMBAT FULL TRACKED: 120MM GUN M1A2	58	354	144	113	128679	20532	3732	64.3395	3352							
T39518	TRUCK CARGO: TACTICAL 8X8 HEAVY EXPANDED MOBILITY W/W WLT CRANE	5	401	102	101	38800	1420	97									
T59278	TRUCK CARGO: TACTICAL 8X8 HEAVY EXPANDED MOBILITY WLT CRANE	10	401	96	101	38800	2673	194									
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	29	187	84	53	5280	3163	77									
T61562	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E W/W (HMMWV)	1	179	84	53	5200	104	3									
T63093	TRUCK WRECKER: TACTICAL 8X8 HEAVY EXPANDED MOBILITY W/WINCH	1	384	101	101	43180	289	22									
T87243	TRUCK TANK: FUEL SERVICING 2500 GALLON 8X8 HEAVY EXP MOB	16	401	96	101	38165	4277	305									
W48391	WELDING SHOP TRAILER MOUNTED: OXY-ACETYLEC ARC	1	179	96	97	7355	119	4									
W68825	TRAILER TANK: WATER 400 GALLON 1-1/2 TON 2 WHEEL W/E	8	162	81	81	2912	729	12									
Z06157	ARMORED MAINTENANCE VEHICLE:	4	283	117	116	56000	920	112	28	2223							
Z36068	TRAILER CARGO: LMTV WIDROP SIDES	19	209	96	58	2491	2647	24									

# Attachment II, Appendix C

Sample Data - Armor Battalion Requirements

LIN	DESCRIPTION	ARMOR BATTALION (HVV DIV) 17375L000 (Two Battalions in the Brigade)										Each		Total		Each		Total				
		ALO1	L	W	H	Weight (Pounds)	Sq Ft	Short Tons	Weight (2K)	Cube	No Data	Weight (Pounds)	Cube (Cubic Ft)									
Z36204	TRAILER CARGO: HIGH MOBILITY 1 1/4 TON	2	136	86	52	1400	162	1														
Z36272	TRAILER CARGO: HIGH MOBILITY 3/4 TON	4	136	86	52	1400	325	3	1.7	539												
Z40430	TRUCK CARGO: 4X4 LMTV W/E	24	255	96	106	20273	4080	243														
Z60951	TRUCK CARGO: 4X4 LMTV W/E WWW	5	255	96	106	20273	850	51														
Z62381	RECOVERY VEHICLE FULL TRACKED: M88A1E1 (IRV)	7	341	144	118	128470	2387	450	64.235	3347												
Z62562	TRUCK UTILITY: EXPANDED CAPACITY 4X4 W/E HMMWW XM1113	2	197	86	71	11500	235	12														
Z62630	TRUCK UTILITY: EXP CPTCY UP-ARMRD ARMT CARR 4X4 W/E HMMWW XM1114	10	197	86	71	12100	1177	61														
Z90712	TRAILER CARGO: MTV WDROPSIDES	1	220	96	58	4733	147	2														
Z93626	TRUCK CARGO: MTV WMH/E W/E	3	306	96	106	26152	612	39														
Z94047	TRUCK TANK: POL MTV W/E	1	314	96	102	26130	209	13														
Z94433	TRUCK WRECKER: MTV WWW W/E	1	359	96	106	36325	239	18														
Large Items																						
A79381	ANTENNA GROUP: OE-254(J)GRC	19	43	40	40	48	227	0	0.024	40			912	756.48								
E69242	COMP UNIT RCP: AIR REC GAS DRVN 15 CFM 175 PSI	1	65	25	40	610	11	0	0.305	38			610	37.62								
F55553	DISTRIBUTION SYSTEM ELEC: 120V 1PH 60AMP	1	60	36	36	400	15	0	0.2	45			400	45.00								
G11966	GEN SET: DED SKID MTD 5KW 60HZ	1	50	32	36	825	11	0	0.4125	34			825	33.33								
G74711	GEN SET: DED SKID MTD 10KW 60HZ	2	62	32	36	1250	28	1	0.625	42			2500	82.67								
H00586	HEATER: DUCT TYPE PORTABLE 1200-00 BTUS	1	65	40	58	355	18	0	0.1775	88			355	87.27								
H35404	HF RADIO SET: AN/GRC-193A	2	27	20	40	130	8	0	0.065	13			260	25.00								
K24862	HEATER DUCT TYPE PTBL: GAS 250000 BTU WHL MTD	4	56	33	55	450	51	1	0.225	59			1800	235.28								
K28601	KITCHEN: COMPANY LEVEL FIELD FEEDING	4	254	91	93	5480	642	11					21920	4975.93								
R14154	RANGE OUTFIT FIELD GASOLINE:	10	27	24	42	253	45	1	0.1265	16			2530	157.50								
R56742	REEL EQUIPMENT: CE-11	42	6	24	36	32	42	1	0.016	4			1344	126.00								
S33399	SANITATION CENTER: FOOD Drain Table	3	49	27	38	41	28	0	0.0205	30			123	87.28								
	Work Table	3	56	26	38	57	30	0					171	96.06								
V19950	TANK UNIT LIQUID DISPENSING TRAILER MOUNTING:	1	73	61	56	410	31	0	0.205	145			410	144.31								
V48441	TENT: FRAME TYPE MAINTENANCE MEDIUM LIGHT METAL COTTON DUCK OD7	1	133	29	26	605	27	0	0.3025	59			605	58.03								
W32593	SHOP EQUIPMENT AUTO MAINT AND REPAIR: OM COMMON NO 1 LESS POWER	4	70	40	36	1002	78	2	0.501	59			4008	233.33								
W32730	SHOP EQUIPMENT AUTO MAINT AND REPAIR: OM COMMON NO 2 LESS POWER	1	167	87	84	4460	101	2	2.23	707			4460	706.27								
W65747	TOOL SET VEHICLE FULL TRACKED: ORG MAINT SUPPL NO 2 LESS POWER	1	64	37	37	1130	16	1	0.565	51			1130	50.70								
Z09768	BCIS INTERROGATOR:	88	63	2	63	3	60	0					204	312.38								
Z10018	BCIS TRANSPONDER:	100	63	2	63	3	88	0					300	459.38								
Z78133	CHEMICALLY AND BIOLOGICALLY PROTECTED SHELTER SYSTEM: (CBPS)	2							2.2	516			8900	1032.00								
Z79610	TENT: EXTENDIBLE MODULAR TEMPER 16L X 20W	3	96	49	35	990	98	1					2970	285.83								
Large Items																						
Sub-totals																						
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Sub-totals																						

## Appendix D



\*as of 26 Sep 97; see page 2 of report under Limitations for additional information.

**Appendix E**  
**Sample Data - Armor Battalion**  
**Cargo**

LIN	SRC 17375L000 (Two Battalions in the Brigade) DESCRIPTION	Qty	Each			
			L	W	H	Weight
			(Inches)			(Pounds)
A03210	ACCESSORY OUTFIT GASOLINE FIELD RANGE: ACCOM 50 MEN	3				
A10837	ADAPTER HARDWARE: M1 PECULIAR (STE-M1/FVS)	6				
A70522	ADAPTER TEST ELECTRICAL SYSTEM BREAKOUT: M1 TANK	6				
A79381	ANTENNA GROUP: OE-254(J)/GRC	19	48	18	12	48
B07126	AXLE CABLE REEL: RL-27	1				
C08565	TRANSIT CASE LOGIC MODULE GROUP:	1				
C18297	COMPUTER SET GENERAL: AN/GYK-33A	1				
C38422	BURNER UNIT GASOLINE FIELD RANGE OUTFIT: W/COMPONENTS	29				
C72376	CASE TRANSIT MONITOR KEYBOARD GROUP: OA-9252/TYQ-33(V)	1				
C72626	CASE TRANSIT PRINTER UNIT GROUP: OA-9251/TYQ-33(V)	1				
C79000	COLLECTIVE PROTECTION EQUIPMENT: NBC SIMPLIFIED M20	4				
C89070	CAMOUFLAGE SCREEN SUPPORT SYSTEM: WOODLAND/DESERT	579				
C96840	CONTROL REMOTE LANDMINE SYSTEM: M71	9				
C99989	CHARGER BATTERY: PP-7382/TAS (NSMF)	1				
D82404	DECONTAMINATING APPARATUS: PWR DRVN LT WT	2				
D99573	CHARGER BATTERY: PP-34/MSM	5				
E03826	ELECTRONIC TEST SET: TS-4348/UV	17				
E69242	COMP UNIT RCP: AIR REC GAS DRVN 15 CFM 175 PSI	1	65	25	40	610
E70064	COMP UNIT RCP: TRK 2 WHL PNEU TIRES GAS DRVN 5 CFM 175 PSI	4				
E98103	ELEC TRANSFER KEYING DEVICE ETKD: KYK-13/TSEC	17				
F55553	DISTRIBUTION SYSTEM ELEC: 120V 1PH 60AMP	1	60	36	36	400
F91490	DEMOLITION SET EXPLOSIVE: INITIATING ELECTRIC AND SEMI ELECTRIC	2				
F91627	DEMOLITION SET EXPLOSIVE: INITIATING NON ELECTRIC	2				
G02341	DETECTING SET MINE: PTBL METALLIC (AN/PSS-11)	12				
G11966	GEN SET: DED SKID MTD 5KW 60HZ	1	50	32	36	825
G18358	GEN SET: DED SKID MTD 3KW 60HZ	11				
G74711	GEN SET: DED SKID MTD 10KW 60HZ	2	62	32	36	1250
G85202	DUPLICATING MACHINE STENCIL PROCESS: BENCH TYPE HAND MTD AUTO FD	1				
H00586	HEATER: DUCT TYPE PORTABLE 1200-00 BTUS	1	65	40	58	355
H35404	HF RADIO SET: AN/GRC-193A	2	27	20	40	130
K24862	HEATER DUCT TYPE PTBL: GAS 250000 BTU WHL MTD	4	56	33	55	450
K27594	KIT GROUND HOP: M1 TANK	6				
K28601	KITCHEN: COMPANY LEVEL FIELD FEEDING	4				
K47623	KY-99: MINTERM	4				
K52926	HOSE ASSEMBLY: NONMETALLIC WATER USE W/PIN ORROCKER LUGWRENCHING	6				
K53748	HOSE ASSEMBLY: NONMETALLIC FUEL/OIL HYDROCARBON USE BRASS FITTIN	28				
L63994	LIGHT SET GENERAL ILLUMINATION: 25 OUTLET (ARMY)	2				
L64131	LIGHT SET MARKER EMERGENCY: AIR FIELD RUN WAY PTBL BATTERY OPRTD	5				
L67964	LIGHTWEIGHT DIGITAL FACSIMILE: AN/UXC-7	2				
M14381	MAST: AB-903/G	1				
M60449	MULTIMETER DIGITAL: AN/PSM-45	7				
N02758	NET CONTROL DEVICE NCD: KYX-15/TSEC	13				
P40750	POWER SUPPLY: PP-6224/U	2				
P70517	PURGING KIT FIRE CONTROL: ORG MAINT	6				
P81748	PROTRACTOR FAN RANGE DEFLECTION: AL 1 TO 50000 METER RANGE	2				
P91756	PUMP CENTRF: GAS DRVN FRAME MTD 1-1/2 IN 65GPM 50 FT HD	2				
P95280	PUMP UNIT: CENTRIFUGAL CAPTURED-FUEL	19				
R14154	RANGE OUTFIT FIELD GASOLINE:	10	27	24	42	253
R56742	REEL EQUIPMENT: CE-11	42	6	24	36	32
R59023	REELING MACHINE CABLE HAND: RL-31	1				
R93169	RADIO TEST SET: AN/PRM-34(I)	6				
S33399	SANITATION CENTER: FOOD Drain Table	3	49	27	38	41
S33399	SANITATION CENTER: FOOD Work Table	3	56	26	38	57
S35741	SAW CHAIN: GAS DRVN BAR FRAME W/ACCESS/COMPONENTS	2				
T06859	TEST SET: COMMON CORE (STE-M1/FVS)	6				
T25726	TONE-SIGNALLING ADAPTER: TA-977( )/PT	1				
T31872	TELEPHONE WIRE WITH REEL: MX-10891/G	11				
T40405	TAPE READER GENERAL PURPOSE: KOI-18/TSEC	16				
T45593	SIGHT BORE OPTICAL:	2				



**Appendix E**  
**Sample Data - Armor Battalion**  
**Cargo**

LIN	SRC 17375L000 (Two Battalions in the Brigade) DESCRIPTION	Qty	Each			
			L	W	H	Weight
			(Inches)			(Pounds)
A03210	ACCESSORY OUTFIT GASOLINE FIELD RANGE: ACCOM 50 MEN	3				
T62350	TEST KIT MASK PROTECTIVE: M41	2				
T62405	TOOL SET BATTALION MAINTENANCE TEAM: ARMOR/MECH INF/FLD ARTY	4				
T77499	TEST SET ELECTRONIC SYSTEMS: AN/PSM-80(V)2	6				
T77567	TEST SET ELECTRONIC SYSTEMS: AN/PSM-80(V)3	5				
U65480	SURGICAL INSTRUMENT AND SUPPLY SET INDIVIDUAL:	4				
U81707	SWITCHBOARD TELEPHONE MANUAL: SB-22/PT	2				
U82529	SWITCHBOARD TELEPHONE MANUAL: SB-993/GT	6				
U89185	UTILITY RECEPTACLE:	2				
V19950	TANK UNIT LIQUID DISPENSING TRAILER MOUNTING:	1	73	61	56	410
V48441	1TENT: FRAME TYPE MAINTENANCE MEDIUM LIGHT METAL COTTON DUCK OD7	1	133	29	26	605
V48441	2TENT: FRAME TYPE MAINTENANCE MEDIUM LIGHT METAL COTTON DUCK OD7	1	188	21	21	615
V48441	3TENT: FRAME TYPE MAINTENANCE MEDIUM LIGHT METAL COTTON DUCK OD7	3	134	12	25	274
V98788	POWER SUPPLY VEHICLE: HYP-57/TSEC	4				
W02526	TESTER AIR FLOW: USED ON VEHICLES W/GAS PARTICULATE FILTER UNITS	5				
W32182	TOOL KIT ARTILLERY MECHANICS: ORD	14				
W32593	SHOP EQUIPMENT AUTO MAINT AND REPAIR: OM COMMON NO 1 LESS POWER	4	70	40	36	1002
W32730	SHOP EQUIPMENT AUTO MAINT AND REPAIR: OM COMMON NO 2 LESS POWER	1	167	87	84	4460
W33004	TOOL KIT GENERAL MECHANICS: AUTOMOTIVE	54				
W34648	TOOL KIT CARPENTERS: ENGINEER SQUAD W/CHEST	5				
W37483	TOOL KIT ELECTRIC EQUIPMENT: TK-101/GSQ	6				
W51910	TOOL KIT SMALL ARMS REPAIRMAN: ORDNANCE	5				
W65747	TOOL SET VEHICLE FULL TRACKED: ORG MAINT SUPPL NO 2 LESS POWER	1	64	37	37	1130
W68117	TORCH SET CUTTING AND WELDING: MEDIUM DUTY	4				
Y85377	WRENCH TORQUE: 3/4 IN SQ MALE DRIVE 600 FT-LB CAPACITY	18				
Z11021	BORESIGHTING EQUIPMENT WEAPON: SMALL ARMS XM30	5				
Z19989	CAMOUFLAGE SCREENING SYS: ULTRA-LTWT RADAR SCATTERING GEN PURPOSE	579				
Z32566	MISSILE SIMULATION ROUND: (MSR) (AAWS-M)	5				
Z48177	OUT STATION: VIDEO SYSTEM (LVRS)	6				
Z63141	MAST ANTENNA 10 METERS: AB-XXX	10				
Z78133	CHEMICALLY AND BIOLOGICALLY PROTECTED SHELTER SYSTEM: (CBPS)	2				
Z79610	TENT: EXTENDIBLE MODULAR TEMPER 16L X 20W	3	96	49	35	990
Z91758	TRAINER SUBCALIBER 120MM MORTAR:	6				
	Based upon 604 Personnel:		lbs per	lbs per	Weight	Volume
			soldier	cu ft	lbs	cu ft
	Accompanying Supplies	604	219.35	10.28	132,487	12,888
	Small Arms Ammo	604	12.7	19.72	7,671	389

# Appendix E

## Sample Data - Armor Battalion

### Loaded

SRC	VEH	VEH	Cargo			Length	Width	Height	Weight
AR BN	LIN	CT	LIN	DESCRIPTION	QTY	(IN)	(IN)	(IN)	(LBS)
	Z36068	1	S33399	SANITATION CENTER	2	56	26	38	114
	Z36068	1	V48441	TENT FRAME TYPE MAINT	1	134	12	25	274
	Z36068	1	Z79610	TENT	1	96	49	35	990
	Z36068	2	A79381	ANTENNA GROUP	19	48	18	12	912
	Z36068	2	S33399	SANITATION CENTER	1	56	26	38	57
	Z36068	3	H00586	HEATER: DUCT PORTABLE	1	65	40	58	355
	Z36068	3	S33399	SANITATION CENTER	3	49	27	38	123
	Z36068	4	K24862	HEATER DUCT TYPE PTBL	2	56	33	55	900
	Z36068	4	Z63141	MAST ANTENNA	3	96	12	6	126
	Z36068	5	K24862	HEATER DUCT TYPE PTBL	2	56	33	55	900
	Z36068	5	Z63141	MAST ANTENNA	7	96	12	6	294
	Z36068	6	V19950	TANK UNIT LIQ DSPNSG	1	73	61	56	410
	Z36068	6		AGG TOE	1				836
	Z36068	7		AGG TOE	1				1976
	Z36068	8		AGG TOE	1				2651
	Z36068	9		AGG TOE	1				4180
	Z36068	10		AGG TOE	1				4180
	Z36068	11		AGG TOE	1				4180
	Z36068	12		AGG TOE	1				4180
	Z36068	13		AGG TOE	1				4180
	Z36068	14		AGG TOE	1				4180
	Z36068	15		AGG TOE	1				4180
	Z36068	16		AGG TOE	1				4180
	Z36068	17		AGG TOE	1				4180
	Z36068	18		AGG TOE	1				4180
	Z36068	19		AGG TOE	1				4180
	Z36204	1		Accompanying Supplies					500
	Z36204	2		Accompanying Supplies					500
	Z36272	1		Accompanying Supplies					500
	Z36272	2		Accompanying Supplies					500
	Z36272	3		Accompanying Supplies					500
	Z36272	4		Accompanying Supplies					500
	Z40430	1		AGG TOE	1				4180
	Z40430	2		AGG TOE	1				4180
	Z40430	3		AGG TOE	1				4180
	Z40430	4		AGG TOE	1				4180
	Z40430	5		AGG TOE	1				4180
	Z40430	6		AGG TOE	1				4180
	Z40430	7		AGG TOE	1				4180
	Z40430	8		AGG TOE	1				4180
	Z40430	9		AGG TOE	1				4180
	Z40430	10		AGG TOE	1				4180
	Z40430	11		AGG TOE	1				4370
	Z40430	12		AGG TOE	1				4370
	Z40430	13		AGG TOE	1				192
	Z40430	14		Small Arms Ammo	1				2557
	Z40430	15		Small Arms Ammo	1				2557
	Z40430	16		Small Arms Ammo	1				2557
	Z40430	17		Accompanying Supplies	1				1500

# Appendix E

## Sample Data - Armor Battalion

### Loaded

SRC AR BN	VEH LIN	VEH CT	Cargo LIN	DESCRIPTION	QTY	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)
	Z40430	18		Accompanying Supplies	1				1500
	Z40430	19		Accompanying Supplies	1				1500
	Z40430	20		Accompanying Supplies	1				1500
	Z40430	21		Accompanying Supplies	1				1500
	Z40430	22		Accompanying Supplies	1				1500
	Z40430	23		Accompanying Supplies	1				1500
	Z40430	24		Accompanying Supplies	1				1500
	Z60951	1	K28601	Field Feeding Kitchen	1				1500
	Z60951	2	K28601	Field Feeding Kitchen	1				1500
	Z60951	3	K28601	Field Feeding Kitchen	1				1500
	Z60951	4	K28601	Field Feeding Kitchen	1				1500
	Z60951	5		Accompanying Supplies	1				1500
	Z90712	1	E69242	COMP RCP AIR PWR D	1	65	25	40	610
	Z90712	1	G74711	GEN SET: DED SKD M	2	62	32	36	2500
	Z90712	1	H35404	RADIO SET HIGH FRE	1	27	20	40	130
	Z90712	1	R56742	REEL EQUIPMENT	9	6	24	36	288
	Z90712	1	V48441	TENT FRAME TYPE MA	1	134	12	25	274
	Z90712	1	W32593	SHOP EQUIP AUTMV L	1	70	40	36	1002
	Z90712	1	W65747	TOOL KIT VEH FTRAC	1	64	37	37	1130
	Z93626	1	G11966	GEN SET: DED SKD M	1	50	32	36	825
	Z93626	1	R14154	RANGE OUTFIT FIELD	1	27	24	42	253
	Z93626	1	R56742	REEL EQUIPMENT	21	6	24	36	672
	Z93626	1	W32593	SHOP EQUIP AUTMV L	3	70	40	36	3006
	Z93626	2	F55553	DISTRIBUTION SYSTEM	1	60	36	36	400
	Z93626	2	H35404	RADIO SET HIGH FRE	1	27	20	40	130
	Z93626	2	R14154	RANGE OUTFIT FIELD	1	27	24	42	253
	Z93626	2	R56742	REEL EQUIPMENT	10	6	24	36	320
	Z93626	2	V48441	TENT FRAME TYPE MA	1	133	29	26	605
	Z93626	2	Z79610	TENT	1	96	49	35	990
	Z93626	3	R14154	RANGE OUTFIT FIELD	8	27	24	42	2024
	Z93626	3	R56742	REEL EQUIPMENT	2	6	24	36	64
	Z93626	3	V48441	TENT FRAME TYPE MA	1	134	12	25	274
	Z93626	3	Z79610	TENT	1	96	49	35	990
									154541
The above list includes the following based upon 604 personnel:									
					Qty	Wt each			Tot Wt
				Accompanying Supplies	6	500			3000
				Accompanying Supplies	9	1500			13500
				Small Arms Ammo	3	2557			7671

# Appendix E

## Sample Data - Armor Battalion Not Loaded

SRC	LIN	Nomenclature	Model	Quantity	Length (inches)	Width (inches)	Height (inches)	Weight (pounds)	weight*qty	aggregate cube ft
AR BN										
	V48441	TENT FRAME TYPE MAINT		1	188	21	21	615	615	48
	W32730	SHOP EQUIP AUTMV L/P	S/E AUTO CM2	1	167	87	84	4460	4460	707
	Z78133	SHELTER (CBPS)	NONE	2	74	54	60	1642	3284	278
not loaded		Personnel based items:			lbs/cu ft		lbs/soldier			
		Accompanying Supplies		604	10.28		219.35		115,987	11283
		Small Arms Ammo		604	19.72		12.7		0	
NO DATA ITEMS*										
New LIN	LIN									
	C18297	COMPUTER SET GENER	AN/GYK-33A	1						
	T77499	TEST SET ELEC	AN/PSM-80(V)2	6						
	T77567	TEST SET ELECT SYS	AN/PSM-80(V)3	5						
	Z32566	MISSILE SIMULATION	AAWS-M	5						
	Z48177	VIDEO SYSTEM (LVRS)	LVRS	6						
M68258	Z91758	TRAINER SUBCALIBER (M303)	120MM MORT	6						
		*These items do not appear in MTMCTEA's database.								

## Appendix E

### Sample Data - Armor Battalion Cargo Vehicles and Trailers

SRC 17375L000						
					Total Capacity	
Vehicle/Trailer Description		LIN	Quantity	Cmt	Max Weight	Cubic Feet
Trailer Cargo, LMTV w/Dropsides M1082	R	Z36068	19	nt	95000	7410
Trailer Cargo, High Mobility 1-1/4 ton M1102	R	Z36204	2	nt	5680	320
Trailer Cargo, High Mobility 3/4 ton M1101	R	Z36272	4	nt	8160	420
Truck Cargo, 4X4 LMTV W/E M1078	R	Z40430	24	pt	120000	7992
Truck Cargo, 4X4 LMTV W/E W/W M1078	R	Z60951	5	pt	25000	1665
Trailer Cargo, MTV w/Dropsides M1095	R	Z90712	1	nt	10000	445
Truck Cargo, MTV w/MHE W/E M1084	R	Z93626	3	pt	30000	1140
<b>Optimal Total</b>					<b>293840</b>	<b>19392</b>
nt: needs a tow						
pt: can provide a tow						

# Appendix E

## Sample Data - Armor Battalion Vehicles and Trailers

SRC	Unit Nomenclature	No. Units	Vehicle/Trailer Description	LIN	TOE Quantity	Cmt	Total Cargo Capacity Max Weight Cubic Feet
17375L000	Armor Battalion (Hwy Div)		Carrier 120MM Mortar, Self-propelled Armor M1064	NR C10990	6	C	0 0
17376L000	HHC, Tank Bn	1	Carrier Armored Command Post, full tracked M1068	NR C11158	3	C	0 0
17377L000	Armor Company	3	Carrier Personnel full tracked, Armored (Rise) M113A3	NR C18234	13	C	0 0
			Cleaner Steam Pressure Jet Trailer Mounted on modified M116A2 Chassis	R C32887	1	nt	0 0
			Carrier Command Post, Light Tracked M577A1	NR D11538	5	C	0 0
			Kitchen Field, Trailer Mounted MFK75A	R L28351	1	C nt	0 0
			Mortar 120mm K6A1	R M68405	6	C	0 0
			Tank Combat Full Tracked, 120MM Gun, M1A2	NR T13305	58	C	0 0
			Truck Cargo Tactical 10T 8X Hwy Exp Mob W/W W/Lt Crane M977 (HEMTT)	R T39518	5	A pt	Dedicated to ammo
			Truck Cargo, Tactical 8X8 Heavy Exp Mobility w/Lt Crane M977 (HEMTT)	R T59278	10	A pt	Dedicated to ammo
			Truck Utility, Cargo/Troop Carrier 1-1/4 ton 4X4 W/E (HMMWV) M998	R T61494	29	C pt	0 0
			Truck Utility, Cargo/Troop Carrier 1-1/4 ton 4X4 W/E W/W (HMMWV) M1038	R T61562	1	C pt	0 0
			Truck Wrecker, Tactical 8X8 Heavy Expanded Mobility w/Winch M984	R T63093	1	C	0 0
			Truck Tank, Fuel Servicing 2500 Gal 8X8 Heavy Exp Mobility M978	R T87243	16	C pt	0 0
			Welding Shop Trailer Mounted, Oxy-Acet/Elec Arc	R W48391	1	nt	0 0
			Trailer Tank, Water 400 Gal 1-1/2 ton 2 Wheel W/E M149A2	R W98825	8	nt	0 0
			Armored Maintenance Vehicle	NR Z06157	4	C	0 0
			Trailer Cargo, LMTV w/Dropsides M1082	R Z36068	19	nt	95000 7410
			Trailer Cargo, High Mobility 1-1/4 ton M1102	R Z36204	2	nt	5680 320
			Trailer Cargo, High Mobility 3/4 ton M1101	R Z36272	4	nt	8160 420
			Truck Cargo, 4X4 LMTV W/E M1078	R Z40430	24	pt	120000 7992
			Truck Cargo, 4X4 LMTV W/E W/W M1078	R Z60951	5	pt	25000 1665
			Recovery Vehicle Full Tracked, M88A1E1 (IRV)	NR Z62381	7	C	0 0
			Truck Utility, Expanded Capability 4X4 W/E HMMWV XM1113	R Z62562	2	C pt	0 0
			Truck Utility, ExpCapUp-Armed Armt Carrier 4X4 W/E HMMWV XM1114	R Z62630	10	C pt	0 0
			Trailer Cargo, MTV w/Dropsides M1095	R Z90712	1	nt	10000 445
			Truck Cargo, MTV w/MHE W/E M1084	R Z93626	3	pt	30000 1140
			Truck Tank, POL MTV W/E M1091	R Z94047	1	C pt	0 0
			Truck Wrecker, MTV W/W W/E M1089	R Z94433	1	C	0 0
	CMT -key						
	nt -needs towing						
	C -combat mission, no cargo						
	pt -can provide towing						
	A -dedicated ammo hauler						
			Totals				293840 19392

**Appendix E**  
**Sample Data - Armor Battalion**  
**Total Equipment**

LIN	ARMOR BATTALION (HVY DIV) 17375L000 DESCRIPTION	Qty	Each			
			L	W	H	Weight
	*Taken together, these represent all TOE equipment minus vehicles and trailers.		(Inches)			(Pounds)
	<b>Cargo*</b>					
A03210	ACCESSORY OUTFIT GASOLINE FIELD RANGE: ACCOM 50 MEN	3				
A10837	ADAPTER HARDWARE: M1 PECULIAR (STE-M1/FVS)	6				
A70522	ADAPTER TEST ELECTRICAL SYSTEM BREAKOUT: M1 TANK	6				
A79381	ANTENNA GROUP: OE-254(J)/GRC	19	48	18	12	48
B07126	AXLE CABLE REEL: RL-27	1				
C08565	TRANSIT CASE LOGIC MODULE GROUP:	1				
C18297	COMPUTER SET GENERAL: AN/GYK-33A	1				
C38422	BURNER UNIT GASOLINE FIELD RANGE OUTFIT: W/COMPONENTS	29				
C72376	CASE TRANSIT MONITOR KEYBOARD GROUP: OA-9252/TYQ-33(V)	1				
C72626	CASE TRANSIT PRINTER UNIT GROUP: OA-9251/TYQ-33(V)	1				
C79000	COLLECTIVE PROTECTION EQUIPMENT: NBC SIMPLIFIED M20	4				
C89070	CAMOUFLAGE SCREEN SUPPORT SYSTEM: WOODLAND/DESERT	579				
C96840	CONTROL REMOTE LANDMINE SYSTEM: M71	9				
C99989	CHARGER BATTERY: PP-7382/TAS (NSMF)	1				
D82404	DECONTAMINATING APPARATUS: PWR DRVN LT WT	2				
D99573	CHARGER BATTERY: PP-34/MSM	5				
E03826	ELECTRONIC TEST SET: TS-4348/UV	17				
E69242	COMP UNIT RCP: AIR REC GAS DRVN 15 CFM 175 PSI	1	65	25	40	610
E70064	COMP UNIT RCP: TRK 2 WHL PNEU TIRES GAS DRVN 5 CFM 175 PSI	4				
E98103	ELEC TRANSFER KEYING DEVICE ETKD: KYK-13/TSEC	17				
F55553	DISTRIBUTION SYSTEM ELEC: 120V 1PH 60AMP	1	60	36	36	400
F91490	DEMOLITION SET EXPLOSIVE: INITIATING ELECTRIC AND SEMI ELECTRIC	2				
F91627	DEMOLITION SET EXPLOSIVE: INITIATING NON ELECTRIC	2				
G02341	DETECTING SET MINE: PTBL METALLIC (AN/PSS-11)	12				
G11966	GEN SET: DED SKID MTD 5KW 60HZ	1	50	32	36	825
G18358	GEN SET: DED SKID MTD 3KW 60HZ	11				
G74711	GEN SET: DED SKID MTD 10KW 60HZ	2	62	32	36	1250
G85202	DUPLICATING MACHINE STENCIL PROCESS: BENCH TYPE HAND MTD AUTO FD	1				
H00586	HEATER: DUCT TYPE PORTABLE 1200-00 BTUS	1	65	40	58	355
H35404	HF RADIO SET: AN/GRC-193A	2	27	20	40	130
K24862	HEATER DUCT TYPE PTBL: GAS 250000 BTU WHL MTD	4	56	33	55	450
K27594	KIT GROUND HOP: M1 TANK	6				
K28601	KITCHEN: COMPANY LEVEL FIELD FEEDING	4				
K47623	KY-99: MINTERM	4				
K52926	HOSE ASSEMBLY: NONMETALLIC WATER USE W/PIN ORROCKER LUGWRENCHING	6				
K53748	HOSE ASSEMBLY: NONMETALLIC FUEL/OIL HYDROCARBON USE BRASS FITTING	28				
L63994	LIGHT SET GENERAL ILLUMINATION: 25 OUTLET (ARMY)	2				
L64131	LIGHT SET MARKER EMERGENCY: AIR FIELD RUN WAY PTBL BATTERY OPRTD	5				
L67964	LIGHTWEIGHT DIGITAL FACSIMILE: AN/UXC-7	2				
M14381	MAST: AB-903/G	1				
M60449	MULTIMETER DIGITAL: AN/PSM-45	7				
N02758	NET CONTROL DEVICE NCD: KYX-15/TSEC	13				
P40750	POWER SUPPLY: PP-6224/U	2				
P70517	PURGING KIT FIRE CONTROL: ORG MAINT	6				
P81748	PROTRACTOR FAN RANGE DEFLECTION: AL 1 TO 50000 METER RANGE	2				
P91756	PUMP CENTRF: GAS DRVN FRAME MTD 1-1/2 IN 65GPM 50 FT HD	2				
P95280	PUMP UNIT: CENTRIFUGAL CAPTURED-FUEL	19				
R14154	RANGE OUTFIT FIELD GASOLINE:	10	27	24	42	253
R56742	REEL EQUIPMENT: CE-11	42	6	24	36	32
R59023	REELING MACHINE CABLE HAND: RL-31	1				
R93169	RADIO TEST SET: AN/PRM-34()	6				
S33399	SANITATION CENTER: FOOD Drain Table	3	49	27	38	41
S33399	SANITATION CENTER: FOOD Work Table	3	56	26	38	57
S35741	SAW CHAIN: GAS DRVN BAR FRAME W/ACCESS/COMPONENTS	2				
T06859	TEST SET: COMMON CORE (STE-M1/FVS)	6				
T25726	TONE-SIGNALING ADAPTER: TA-977() /PT	1				
T31872	TELEPHONE WIRE WITH REEL: MX-10891/G	11				
T40405	TAPE READER GENERAL PURPOSE: KOI-18/TSEC	16				
T45593	SIGHT BORE OPTICAL:	2				
T62350	TEST KIT MASK PROTECTIVE: M41	2				

**Appendix E**  
**Sample Data - Armor Battalion**  
**Total Equipment**

LIN	ARMOR BATTALION (HVV DIV) 17375L000 DESCRIPTION	Qty	Each			
			L	W	H	Weight
	*Taken together, these represent all TOE equipment minus vehicles and trailers.		(Inches)			(Pounds)
T62405	TOOL SET BATTALION MAINTENANCE TEAM: ARMOR/MECH INF/FLD ARTY	4				
T77499	TEST SET ELECTRONIC SYSTEMS: AN/PSM-80(V)2	6				
T77567	TEST SET ELECTRONIC SYSTEMS: AN/PSM-80(V)3	5				
U65480	SURGICAL INSTRUMENT AND SUPPLY SET INDIVIDUAL:	4				
U81707	SWITCHBOARD TELEPHONE MANUAL: SB-22/PT	2				
U82529	SWITCHBOARD TELEPHONE MANUAL: SB-993/GT	6				
U89185	UTILITY RECEPTACLE:	2				
V19950	TANK UNIT LIQUID DISPENSING TRAILER MOUNTING:	1	73	61	56	410
V48441	1TENT: FRAME TYPE MAINTENANCE MEDIUM LIGHT METAL COTTON DUCK OD7	1	133	29	26	605
V48441	2TENT: FRAME TYPE MAINTENANCE MEDIUM LIGHT METAL COTTON DUCK OD7	1	188	21	21	615
V48441	3TENT: FRAME TYPE MAINTENANCE MEDIUM LIGHT METAL COTTON DUCK OD7	3	134	12	25	274
V98788	POWER SUPPLY VEHICLE: HYP-57/TSEC	4				
W02526	TESTER AIR FLOW: USED ON VEHICLES W/GAS PARTICULATE FILTER UNITS	5				
W32182	TOOL KIT ARTILLERY MECHANICS: ORD	14				
W32593	SHOP EQUIPMENT AUTO MAINT AND REPAIR: OM COMMON NO 1 LESS POWER	4	70	40	36	1002
W32730	SHOP EQUIPMENT AUTO MAINT AND REPAIR: OM COMMON NO 2 LESS POWER	1	167	87	84	4460
W33004	TOOL KIT GENERAL MECHANICS: AUTOMOTIVE	54				
W34648	TOOL KIT CARPENTERS: ENGINEER SQUAD W/CHEST	5				
W37483	TOOL KIT ELECTRIC EQUIPMENT: TK-101/GSQ	6				
W51910	TOOL KIT SMALL ARMS REPAIRMAN: ORDNANCE	5				
W65747	TOOL SET VEHICLE FULL TRACKED: ORD MAINT SUPPL NO 2 LESS POWER	1	64	37	37	1130
W68117	TORCH SET CUTTING AND WELDING: MEDIUM DUTY	4				
Y85377	WRENCH TORQUE: 3/4 IN SQ MALE DRIVE 600 FT-LB CAPACITY	18				
Z11021	BORESIGHTING EQUIPMENT WEAPON: SMALL ARMS XM30	5				
Z19989	CAMOUFLAGE SCREENING SYS: ULTRA-LTWT RADAR SCATTERING GEN PURPOSE	579				
Z32566	MISSILE SIMULATION ROUND: (MSR) (AAWS-M)	5				
Z48177	OUT STATION: VIDEO SYSTEM (LVRS)	6				
Z63141	MAST ANTENNA 10 METERS: AB-XXX	10				
Z78133	CHEMICALLY AND BIOLOGICALLY PROTECTED SHELTER SYSTEM: (CBPS)	2				
Z79610	TENT: EXTENDIBLE MODULAR TEMPER 16L X 20W	3	96	49	35	990
Z91758	TRAINER SUBCALIBER 120MM MORTAR:	6				
	<b>Other items - dispersed, small, incorporated or mounted on something else, etc.*</b>					
A22496	AIMING CIRCLE:	2				
B49272	BAYONET-KNIFE: W/SCABBARD FOR M16A1 RIFLE	565				
B67766	BINOCULAR: MODULAR CONSTRUCTION MIL SCALE RETICLE 7X50MM W/E	98				
B90494	BORESIGHTING EQUIPMENT WEAPON: MUZZLE ALIGNMENT	58				
C05541	CONTROL RECEIVER-TRANSMITTER: C-11561(C)/U	12				
C05701	MONITOR CHEMICAL AGENT:	10				
C68719	CABLE TELEPHONE: WD-1/TT DR-8 1/2 KM	167				
C68856	CABLE TELEPHONE: WD-1/TT RL-159/U 2 KM	2				
C69541	CABLE TELEPHONE: WF-16/U	1				
E10835	CHEST HYMNBOOK: W/HANDLES	1				
E63728	COMPASS MAGNETIC UNMOUNTED: MIL GRADUATIONS	8				
G44569	DRAFTING EQUIPMENT SET BATTALION: CHARTS SKETCHES AND OVERLAYS	1				
H48896	FILTER UNIT GAS PARTICULATE ARMORED AMBULANCE: M14	8				
J31569	INST KIT: MK-2325/VRC FOR AN/VRC-87/88/90 IN HMMWV	10				
J32063	INSTALLATION KIT: MK-2460/GRC-193A F/AN/GRC-193A IN M577A1	1				
J32199	INSTALLATION KIT: MK-2462/GRC-193 F/AN/GRC-193A IN M882/M1008A1	1				
J32267	INSTALLATION KIT: MK-2445/GRC-213 F/AN/GRC-213 IN M577A1	4				
J47151	INST KIT: MK-2204/VRC FOR AN/VRC-87/88/89 IN M987 M984 M988	1				
J47457	INST KIT: MK-2326/VRC FOR AN/VRC-89/91/92 IN HMMWV	34				
J88547	INSTALLATION KIT ELECTRONIC EQUIPMENT: MK-2565/VRC-97	1				
K23814	HEADSET-MICROPHONE: H-182/PT	6				
L44595	LAUNCHER GRENADE 40 MILLIMETER: SGLE SHOT RIFLE MTD DTCHBLE W/E	18				
L44748	LAUNCHER GRENADE ARMAMENT SUBSYSTEM: SCREEN RP M259	8				
L91975	MACHINE GUN CALIBER .50: HB FLEXIBLE (GROUND AND VEHICLE) W/E	105				
L92352	MACHINE GUN 7.62 MILLIMETER: FIXED	116				
L92386	MACHINE GUN 7.62 MILLIMETER: LIGHT FLEXIBLE	5				
M09009	MACHINE GUN 5.56 MILLIMETER: M249	5				
M12418	MASK CHEMICAL BIOLOGICAL: M40	247				



**Appendix E**  
**Sample Data - Armor Battalion**  
**Total Equipment**

LIN	ARMOR BATTALION (HVY DIV) 17375L000 DESCRIPTION	Qty	Each			
			L	W	H	Weight
	*Taken together, these represent all TOE equipment minus vehicles and trailers.		(Inches)			(Pounds)
M18526	MASK CHEMICAL BIOLOGICAL: COMBATVEHICLE M42	357				
M23673	MEDICAL EQUIPMENT SET CHEMICAL AGENT PATIENT TREATMENT:	2				
M25865	MEDICAL EQUIPMENT SET CHEMICAL AGENTS PATIENT DECONTAMINATION:	1				
M26413	MEDICAL EQUIPMENT SET GROUND AMBULANCE:	8				
M30156	MEDICAL EQUIPMENT SET SICK CALL FIELD (2):	2				
M30499	MEDICAL EQUIPMENT SET TRAUMA FIELD (2):	2				
M74364	MOUNT GUN: RING CAL .50	20				
M74849	MINI EYESAFE LASER INFRARED OBSERVATION SET (MELIOS): AN/PVS-6	10				
M75577	MOUNT TRIPOD MACHINE GUN: HEAVY CALIBER 50	42				
M75714	MOUNT TRIPOD MACHINE GUN: 7.62 MILLIMETER	5				
M92362	MACHINE GUN GRENADE 40MM: MK19 MOD III	5				
N05050	NIGHT VISION SIGHT SET: AN/UAS-11	2				
N05482	NIGHT VISION GOGGLE: AN/PVS-7B	420				
P06148	PLATOON EARLY WARNING SYSTEM: AN/TRS-2(V)	14				
P07900	PLOTTING BOARD INDIRECT FIRE: AZIMUTH	10				
P49587	PJH SURFACE VEHICLE RADIO SET: AN/VSQ-2(V)1 (PJHI)	6				
P98152	PISTOL 9MM AUTOMATIC: M9	297				
Q03468	QUADRANT FIRE CONTROL: GUNNERS	61				
R20684	RADIAC SET: AN/VDR-2	40				
R30895	RADIO SET: AN/GRC-213	2				
R30925	RADIAC SET: AN/PDR-75	5				
R44863	RADIO SET: AN/VRC-89A	36				
R45407	RADIO SET: AN/VRC-92A	25				
R59160	REELING MACHINE CABLE HAND: RL-39	58				
R67160	RADIO SET: AN/VRC-87A	26				
R67194	RADIO SET: AN/VRC-88A	8				
R67908	RADIO SET: AN/VRC-90A	31				
R68010	RADIO SET: AN/VRC-91A	10				
R83005	RADIO SET: AN/PRC-119A	6				
R84904	REPRODUCTION SET DIAZO PROCESS:	1				
R95035	RIFLE 5.56 MILLIMETER: M16A2	294				
R97234	RIFLE 5 56 MILLIMETER: M4	142				
S64488	SPEECH SCTY EQUIP DIGITAL SUBSCRIBER VOICE TERMINAL: TSEC/KY-68	10				
T45408	TELEPHONE DIGITAL NON-SECURE VOICE: TA-1035/U	9				
T55957	TERMINAL RADIO-TELEPHONE MOBILE SUBSCRIBER: AN/VRC-97	2				
V30252	TELEPHONE SET: TA-1/PT	42				
V31211	TELEPHONE SET: TA-312/PT	46				
Y34027	WATCH WRIST: NON MAINTAINABLE	87				
Z04910	ALARM CHEMICAL AGENT AUTOMATIC: XM22	31				
Z09000	LOGMARS(T) COMMUNICATIONS MODEM GROUP: CY-8538/G	5				
Z09768	BCIS INTERROGATOR:	68	63	2	63	3
Z09773	BASE STATION LIGHTWEIGHT SYS: LVRS	3				
Z10018	BCIS TRANSPONDER:	100	63	2	63	3
Z10767	BINOCULAR: STABILIZED XM25	68				
Z15752	COMMAND AND LAUNCH UNIT: (JAVELIN)	5				
Z17296	COMPUTER SET: DIGITAL AN/TYQ-53	1				
Z19791	COUNTERMEASURES SET: AN/VLQ-6	58				
Z23386	DISCHARGER GRENADE: COUNTERMEASU	320				
Z24522	DRIVER'S VISION ENHANCER:	50				
Z28333	FREQUENCY HOPPING MULTIPLEXER: (FHMUX)	2				
Z35294	INSTALLATION KIT: MK-XXXX/VSQ (M1A2)	4				
Z36072	KEY PROCESSOR KP TSEC/KOK-22	1				
Z36291	KIT ARMOR: M113A3 APC BLOCK II MODIFICATION	13				
Z37940	LASER COUNTERMEASURE SYSTEM: AN/PLQ-XX	10				
Z38190	LASER COUNTERMEASURES SYSTEM: AN/PLQ-4( )	10				
Z38272	LIGHTWEIGHT WEAPON SIGHTS: (THERMAL RIFLE SIGHT)	5				
Z38356	LIGHTWEIGHT WEAPON SIGHT: (SQUAD/PLATOON SURVEILLANCE DEVICE)	10				
Z38366	LIGHTWEIGHT WEAPON SIGHT: (THERMAL CREW SERVED WEAPON SIGHT)	100				
Z44778	MONOCULAR NIGHT VISION DEVICE	2				
Z44784	MORTAR BALLISTIC COMPUTER: XM30	4				
Z45663	MOUNT MACHINE GUN PURPOSE: MK93 MOD1	5				

**Appendix E**  
**Sample Data - Armor Battalion**  
**Total Equipment**

LIN	ARMOR BATTALION (HVY DIV) 17375L000 DESCRIPTION	Qty	Each			
			L	W	H	Weight
	*Taken together, these represent all TOE equipment minus vehicles and trailers.		(Inches)			(Pounds)
Z46135	COMMON HARDWARE MANEUVER CONTROL SYSTEM: (CHMCS)	2				
Z49303	DIGITAL DATA SET: AN/PSG-7 (V)1	69				
Z50144	LOGMARS(T) MICROPROCESSOR GROUP: CY-8537/G	5				
Z51550	IK CARRIER COMMAND M-577A1: MK-2219	2				
Z55070	KIT: VEHICULAR EQUIPMENT COMPONENTS HMMWV SCOUT	10				
Z70236	NAVSTAR GPS PRECISION LIGHTWEIGHT GPS RECEIVER: (PLGR)	127				
Z73265	SIGHT REFLEX: COLLIMATOR XM68	30				
Z75367	POCKET RADIAC:	33				
Z98001	WATER HEATER: MOUNTED RATION	106				

## Sample Data - Armor Battalion Towing Capabilities vs Requirements

E-12

# Appendix F Truck Unit Capacity/Capability Data Non-Divisional Truck Units

TVAR and Capacity Data for Trucks in TC Non-Divisional Truck unit SRCs

13-Jul-95	SRC	TITLE	TRKS	TVAR			CNTNR / TRIP			CONTAINER TONS/TRIP			BB TONS/TRIP			GALLONS/TRIP		PAX/ TRIP	TRIP/ DAY	NOTES
				LVL1	LVL2	LVL3	40 FT	20 FT	PLS	40 FT	20 FT	GEN	20 FT	GEN	AMMO	POL	WATER			
557191000		LT MDM TRK CO																		
		5T CARGO	50	0.859	0.812	0.732								2.97	5.00			20		1,2,3,8
		TRAC/STLR	10	0.847	0.801	0.722			1			6.47		4.79	8.62			35		1,2,3,8
55727L100/200		MDM TRK CO (EAC)	60	0.875	0.828	0.753	1	2		15.42	12.94		27.80	7.02	12.61	7500	4570	50		1,2,3,4,5,8
55728L100/200		MDM TRK CO (CORPS)	60	0.847	0.801	0.722			1			6.47	13.90	4.79		5000	3000	35		1,2,3,4,5,8
55728L300		MDM TRK CO (CORPS) PLS	48	0.905	0.868	0.793			2						22.00					6,7,9
55739L100		CBT HET CO	96	0.9	0.81	0.72												1	10	

## General Comments:

- The TVAR data, while based upon truck type, applies only at SRC level of detail.
- The capacity data is individual truck specific.

## Notes:

- TVAR data source is TRAC-LEE TVAR Study, May 1995.
- BB Tons per trip data source is USATSCH/CASCOM Cargo Density Factor Study, 1994.
- Containerized tons per trip data source is USATSCH/CASCOM Mean Container Content Weight Study, 1994.
- Water is carried in Semi-trailer Mounted Fabric Tanks (SMFTs). SMFTs are 4570 and 3000 gallons; they can be carried full or empty but not partial.
- POL is carried in tanker semitrailers (7500 and 5000 gallons). They can be transported partially filled.
- PLS trucks carry only ammunition in Combat Configured Loads (CCLs). Mean weight is 11.0 tons per CCL.
- All data rounded to nearest whole number.
- Semitrailers carry personnel only in emergencies.
- There are 48 trucks plus 48 trailers in this unit. Each can carry one PLS flatrack (two per trk & tlr combination per trip).
- HETs perform tactical/operational relocate missions; not consistent with Line or Local Haul concepts.

# Appendix F

## Truck Unit Capacity/Capability Data

### Non-Divisional Capability

#### Non Divisional TC Truck Company SRC Capability Data

13-Jul-95

CONTAINERIZED TONS/DAY												PAX PER LIFT	TRIPS PER DAY
CONTAINERS		GENERAL		AMMO		BB TONS/DAY		GALLONS/DAY					
TOE	40 FT	20 FT	40 FT	20 FT	40 FT	20 FT	GEN	AMMO	POL	WATER			
LEVEL 1 LINE HAUL													
55719L000		17		110				336	576			1155	
55727L100/200	105	210	1619	1359		2919	737	1324	787500	479850		2625	
55728L100/200		102		658			487		508200	304920		1779	
55728L300								1911					
55739L100													86
LEVEL 1 LOCAL HAUL													
55719L000		34		219			673	1151					
55727L100/200	210	420	3238	2717		5838	1474	2648	1575000	959700			
55728L100/200		203		1315			974		1016400	609840			
55728L300								3823					NA
55739L100													
LEVEL 2 LINE HAUL													
55719L000		16		104			318	544				1155	
55727L100/200	99	199	1532	1286		2762	698	1253	745200	454075		2625	
55728L100/200		96		622			460		480600	288360		1779	
55728L300								1833					
55739L100													78
LEVEL 2 LOCAL HAUL													
1. All data rounded		32		207			636	1088					
55727L100/200	199	397	3064	2571		5524	1395	2506	1490400	908150			
55728L100/200		192		1244			921		961200	576720			
55728L300								3666					NA
55739L100													
LEVEL 3 LINE HAUL													
55719L000		14		93			287	490				985	
55727L100/200	90	181	1393	1169		2512	634	1139	677700	412945		2259	
55728L100/200		87		561			415		433200	259920		1516	
55728L300								1675					
55739L100													69
LEVEL 3 LOCAL HAUL													
55719L000		29		187			573	981					
55727L100/200	181	361	2787	2339		5024	1269	2279	1355400	825890			
55728L100/200		173		1121			830		866400	519840			
55728L300								3350					
55739L100													NA

#### Notes:

- The data in the cells for each SRC represent exclusive capability. For example:  
The Level 1 Line haul capability for 55727L100 is 105 40 foot containers per day or 210 20 foot containers per day or an intermediate value reflecting a combination. But, if the unit is carrying containers, it cannot carry breakbulk cargo. A POL unit (727L200) cannot carry any other type cargo and if the cargo trucks are equipped with SMFTs, the unit cannot carry any cargo other than water.
- Semitrailers only carry passengers in emergency conditions. Cargo trucks routinely carry them. The passenger (pax) data represents a single lift for each type unit using all the available trucks.
- The data in this table is rounded. Normally Local Haul capability for a unit is exactly double the line haul capability. When this data is recorded in a TOE section 1, it will be further rounded.

# Appendix F

## Truck Unit Capacity/Capability Data

### TMT Truck Companies

TVAR and Capacity Data for Trucks in TC Divisional Truck unit SRCs

13-Jul-95												
SRC	TITLE	TRKS	TVAR			BB TONS/TRIP		PAX/ TRIP	LIFT/ TRIP	NOTES		
			LVL1	LVL2	LVL3	GEN	AMMO					
55138L000	TMT CO, MSB, INF DIV									1,2		
	5T CARGO	40	0.859	0.812	0.732	2.97	5.00	20				
	TRAC/STLR	30	0.847	0.801	0.722	4.79	8.62	35				
	HET	6	0.75	0.75	0.75				1	3		
55158L000	TMT CO, MSB, ABN DIV									1,2		
	2.5T CARGO	40	0.859	0.812	0.732	2.50	2.50	18				
	TRAC/STLR	12	0.847	0.801	0.722	4.79	8.62	35				
55168L000	TMT CO, MSB, AASLT DIV									1,2		
	5T CARGO	40	0.859	0.812	0.732	2.97	5.00	20				
	TRAC/STLR	10	0.847	0.801	0.722	4.79	8.62	35				
55178L000	TMT CO, LID									1,2		
	5T CARGO	33	0.859	0.812	0.732	2.97	5.00	20				
	TRAC/STLR	8	0.847	0.801	0.722	4.79	8.62	35				
55188L000	TMT CO, MSB, HVY DIV									1,2		
	5T CARGO	36	0.859	0.812	0.732	2.97	5.00	20				
	TRAC/STLR	33	0.847	0.801	0.722	4.79	8.62	35				
	HET	24	0.75	0.75	0.75				1	3		

1. The Trucks and tractor/trailers in this unit normally do not carry ammunition.
2. All data rounded to nearest whole number.
3. Assumes one tank per HET. Some tracks (M113) can go two per HET.

# **Appendix F** **Truck Unit Capacity/Capability Data** **TMT Co Capability**

## **Divisional TC Truck Company SRC Capability Data**

13-Jul-95								
TOE	DISPATCHES PER DAY			SINGLE LIFT			VEH	REMARKS 1,2
	TRK CGO	TRAC/ STLR	HET	TONS GEN   AMMO		PAX		
LEVEL 1 CAPABILITY								
55138L000	34	25	5	224	391	1577	5	3,4
55158L000	34	10		135	174	801		3
55168L000	34	8		143	245	984		3
55178L000	28	7		117	200	804		3
55188L000	31	28	18	226	396	1597	18	3,4
LEVEL 2 CAPABILITY								
55138L000	32	24	5	212	370	1491	5	3,4
55158L000	32	10		127	164	921		3
55168L000	32	8		135	231	930		3
55178L000	27	6		110	189	760		3
55188L000	29	26	18	213	374	1510	18	3,4
LEVEL 3 CAPABILITY								
55138L000	29	22	5	191	333	1344	5	3,4
55158L000	29	9		115	148	830		3
55168L000	29	7		122	209	838		3
55178L000	24	6		99	171	685		3
55188L000	26	24	18	192	337	1361	18	3,4

1. All data rounded to nearest whole number.
2. TMT Companies normally do not perform Line or Local Haul missions as normally defined in doctrine; they are organic to the division.
3. These units normally do not transport ammunition.
4. HETs used for evacuation missions - one tank per HET.